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Calibration of consumer and homemaking test items using the Rasch procedure

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ABSTRACT

The purpose of the study was to use the Rasch procedure of item calibration in selecting consumer and homemaking test items. Specific objectives were to calibrate an available pool of consumer and homemaking items using the Rasch procedure, a latent-trait test theory model, and to compile the items in a form to be used by secondary consumer and homemaking teachers when assessing student achievement.

The stratified random sample of Iowa vocational homemaking programs included 101 districts; teachers provided lists of students who had enrolled in four or more semesters of consumer and homemaking education and who were willing to respond to an achievement test.

From a pool of 230 items, five forms of a comprehensive achievement test were developed. The test items reflected the emphasis of the six content areas of consumer and homemaking programs in secondary schools. Each of the 1039 students responded to one form of the test.

Items selected were at or near the expectations of the model. Items were not deleted because they did not fit any one dimension of the model.

The first criteria inspected to determine items for deletion were total t fit (t-test total) which should show a gradual change in t-test total from item to item, and error impact at or above .03. If an item failed to meet the expectations of one or both of the criteria, then additional criteria were inspected to determine items to be deleted before recalibration.

For all forms of test, a large portion of the deleted items had t-test totals which deviated from the items preceding it by .25 or more. The error impact was above .03 for 15 of the items and at .03 for two items.

For the Item Characteristic Curve and the departure from expected Item Characteristic Curve which reflect response patterns of the ability groups, the 17 items were irregular for the ability group represented in the sample. Ten of the deleted items were found to be distributed above the mean ability of the sample on which the particular item was calibrated and seven items fell below the mean.

Discrimination indices ranged from .02 to .49, with the expected index being 1.0. Most of the 17 items had fit between, measured in standard deviations, significantly greater than the standard deviation of the group in which each item was a member.

The person separability indices, equivalent to Kuder-Richardson 20 were .70, .68, .77, .73, and .68 for Forms A, B, D, C, and E, respectively, in the first analysis. In the second analysis after the 17 items were deleted, they changed to .71 for Form A, .69 for Form B, .76 for Form D, .71 for Form E, and remained constant for Form C.

Although some remaining items had irregularities, they were judged to fit the model. In all, 93% or 213, of the 230 items fit the model.

Based on the results of the study, it is recommended that the final test be recalibrated with additional items to improve content validity. If more than one form is used, identical items could be placed in each form for linking the tests. Variations in sample size will

assist in determining a size for stable indices. A better understanding of the usefulness of the Rasch model may yield information of help to practitioners.

INTRODUCTION

For many years, tests of ability or achievement have been used for a variety of purposes. One purpose of tests is to assess the effectiveness of particular programs. When tests are used as a method of assessing effectiveness, there is a need to determine if a particular program is achieving its objectives or to decide if the program is more or less successful than other programs with the same objectives (Hashway, 1978).

Consumer and homemaking education has as its purpose the preparation of individuals for the occupation of homemaking. In this case, evaluation of program effectiveness becomes concerned with how well participants have been prepared for the homemaking role (Crawford, 1980). Achievement tests can serve as one means of gathering data about consumer and homemaking education programs.

Bejar (1980) believes that despite extensive use of test scores, little attention is given to psychometric problems, as opposed to design problems, by those implementing a program. In the past, evaluation of social and educational programs has most often been reduced to statistical analysis of test scores from several groups or from the same group observed under different conditions (Bejar, 1980).

An important measurement problem in evaluative research is inferences made when the measurement instrument does not have the same psychometric properties as the group being compared (Campbell & Boruch, 1975). Refinements in the procedures used to construct these tests have

been made (Lord & Novick, 1968). However, the main assumption underlying the test construction is that the subjects are randomly distributed over the ability dimension (Lord & Novick, 1968). Item selection techniques, which are traditionally used to construct typical tests, are designed to ensure a normal distribution of test scores (Lord & Novick, 1968). This is the classical theory of test construction.

To combat the problems found in the classical theory of test construction, Wright (1967, Note 1) argued that tests should produce scores that exhibit two characteristics: Two tests purporting to assess the same ability or attainment domain should result in the same scores for the same person, and a test score should not be a function of the group used to determine item statistics for the test. Rasch (1966) has presented an item selection technique that is intended to produce tests with characteristics corresponding to those described by Wright (Note 1).

The Rasch procedure is primarily a test construction model; that is, it provides a specific theory about those test items that ought to be used in putting a test together, as well as what the consequences will be in terms of resulting measurements (Rentz & Rentz, 1979). The Rasch procedure purports to result in tests which are independent of the sample. Rasch tests do not possess the "undesirable" properties frequently associated with traditionally constructed tests (Hashway, 1978). It appears that tests constructed with the Rasch model have wider usability than the traditional tests.

Those conducting research on the impact of consumer and homemaking programs have used achievement tests as one method of gathering data.

The achievement tests have been constructed using the classical theory of test construction. Since problems occur when inferences are made based on these tests, tests may be designed using construction techniques which produce tests for use with more heterogeneous groups. The use of the Rasch procedure of item calibration leads to tests which are usable over more heterogeneous groups than the classical procedure.

This study was part of the long-range efforts for evaluating consumer and homemaking programs in Iowa by the Department of Home Economics Education and the Department of Public Instruction.

The purpose of this study was to use the Rasch procedure of item calibration in selecting consumer and homemaking test items. The test items were a collection of 230 items reflecting the six content areas of consumer and homemaking education programs. The specific objectives of this study were to calibrate the available pool of consumer and homemaking items using the Rasch procedure of item calibration which is one area of latent-trait test theory, and to compile calibrated items in a form to be used by secondary consumer and homemaking teachers when assessing students achievement.

The assumptions made for this study were: (1) The students will answer the questions to the best of their abilities using knowledge acquired through participation in at least four semesters of consumer and homemaking education which covers the six content areas, (2) The sample of secondary home economics students will contain some members who will not be enrolled in consumer and homemaking classes at the time the

test is administered, and (3) The students response to items are the result of the student's ability and the easiness of the item.

A limitation of the study was the overall sample size in the study was sufficient for fitting items to the Rasch model, but the sample size responding to each of the five forms of the test is small and may not provide stable indices.

Definitions

The following operational definitions were selected for this study.

Consumer and homemaking education: The educative process of preparing females and males for their roles as homemakers with skills in family relations, child development and parenting, food and nutrition, clothing and textiles, consumer education and management, and housing/home furnishings, and equipment (Cross, 1980, p. 37).

Item calibration: The evaluation of the fit of items to a model and the estimation of the difficulty parameter value for each item (Rentz & Rentz, 1979, p. 2).

Latent-trait test theory: A test theory which allows one to analyze test scores when examinee's performance is presumed to be a result of an unobservable trait (Allen & Yen, 1979, p. 229).

Rasch one-parameter model: The latent-trait model which takes into account a difficulty level at which an examinee has a 50 percent chance of correctly answering an item (Brown, 1980, Note 2).

REVIEW OF LITERATURE

Achievement testing is one method by which effectiveness of educational programs is assessed. Since a problem of generalizability occurs with traditionally constructed achievement tests, research suggests that latent-trait models provide for the construction of an achievement test which is more generalizable. The Rasch, a one-parameter model, is one latent-trait model which may provide a means of constructing tests which are more useful.

There is a need in consumer and homemaking education for achievement tests which can provide more useful information to those using the tests for the evaluation of students and programs. With more generalizable tests, consumer and home economics teachers would have available a pool of items from which to select items to be given to students as the need arose and could be updated as needed.

The review of literature which follows includes a brief overview of achievement testing in general. That section is followed by a discussion of evaluation of consumer and homemaking education programs. The remainder of the review focuses on review of the classical test theory model, a brief history of latent-trait models, and, finally, the Rasch test theory model.

Achievement Testing

Through the years, tests of ability or achievement have been used for various purposes. Hashway (1978, p.1) stated three purposes for which tests have been used: (1) to initially screen students in an

attempt to determine those students who satisfy particular criteria unique to particular programs, (2) to track pupil attainment over time in order to determine pupil progress, and (3) to assess the effectiveness of particular programs. Hashway broke the third purpose into two questions which one is interested in answering. One question is whether or not one particular program is achieving the objectives for which it was intended. The second question is whether or not one program or group of programs are more or less successful than other programs designed to achieve the same objectives.

The demands being made by educational policy makers for applications of measurement to significant new tasks are having far reaching effects on education and measurement. The measurement professionals are being asked to address the educational needs of special groups, as well as evaluating the worth of old and new educational programs.

Many programs have used achievement tests as a means of determining where students stood. One program which is directed at a specific audience is bilingual education. Swanson (1979) related in a paper at 1978 Educational Testing Service invitational conference the problems faced in the bilingual education program. She expressed that there was a need to properly identify and diagnose the specific linguistic and educational needs of non-English speaking students. Provision of meaningful educational experiences for them while they were learning English remained a crucial issue for those involved in bilingual education.

As a result of congressional mandates, students in bilingual programs were to be assessed. When attempts were made to evaluate students, the complexities of diverse levels of language proficiency created problems in testing. It was found that translating existing English language tests was unsatisfactory because people of different ethnic and linguistic backgrounds do not think in the same manner, structure thoughts in the same way or learn equivalent words and concepts in the same order. In her presentation, it was evident that the program could not be adequately evaluated due to the inability to assess the knowledge of the students.

Achievement tests were used in the National Assessment of Educational Progress (NAEP). The major purpose of that program was to provide the lay public with data on the educational achievement of children, youth, and adults. The data were to furnish dependable information about educational attainments, the progress being made, and the problems faced in achieving educational aspirations (Tyler, 1973). It appeared that testing programs commonly conducted in the schools do not provide information about what students have learned. He noted that interesting and valuable by-products appeared through the NAEP. The by-products of interest when considering the effectiveness of programs are the clarification of the difference between testing for sorting and testing that can help substantially in the education and guidance of individuals, and the demonstration that appraisal exercises can be constructed to provide information about the progress of the entire range of school children, not merely data about the so-called "average" child.

Tyler related that in reviewing current tests to see if they could be used in the national assessment, it was found that more than 80% of the items in the most widely used achievement tests fell between the 40% and 60% level of difficulty. Further, only about 5% of the items were exercises which could be answered by students in the lower third of the class and another 5% represented tasks appropriate for the upper third. When assessing the progress of education, we need to know what all children are learning.

Although some have not agreed that achievement tests should be used for these purposes, achievement tests have been used with success in education to assess where students are and if programs should be continued. In most cases, achievement tests will not be the only assessment device. Ahmann and Glock (1981) suggest that in practice, information on the degree of achievement of educational objectives is always augmented by additional information on the pupil's earlier interests, value, aptitudes, and achievements.

Evaluation of Consumer and Homemaking Programs

Over the last 120 years, this nation has become increasingly aware of social problems which affect special groups of the population (Weiss, 1972). With this increase in awareness have come various social programs which were directed at alleviating the problems. In order to determine the effectiveness of the various social programs, there was a need for evaluation.

Achievement testing as well as other methods of data collection have been used to acquire information on the effects of consumer and homemaking programs. The research has been mostly in specific areas such as food and nutrition, consumer education, and parenthood education. Here, researchers have addressed how these programs have impacted on the learner. Though they have not looked at the entire consumer and homemaking program, they do give credence to the effectiveness of consumer and homemaking programs on the life of those participating in the course (Hughes, et al., 1979; Crawford, 1980; Sand, 1980).

Hughes (et al., 1979) stressed the importance of presenting data to show the effectiveness of consumer and homemaking programs. She was careful to point out the lack of information directed specifically at consumer and homemaking programs. In her presentation, however, she showed how achievement tests had been used as one means of assessing effectiveness and related results of studies by other researchers who had used achievement as part of their assessment of consumer and homemaking programs. For instance, Hughes stated that the procedures used by Scruggs in a 1959 study to assess pupil gain in classrooms were appropriate as one dimension in assessing effectiveness of consumer and homemaking programs. There does exist a series of tests which assess specific areas of consumer and homemaking education (Nece, 1979; Sand, 1980; Crawford, 1980; Amos and Woods, 1980, Note 3).

Nece (1979) conducted a study to design a food and nutrition test for tenth, eleventh, and twelfth grade students based on competencies identified in the Iowa Guide for Teaching Food Use and Nutrition

Education (1978). For her study, the 16 schools selected to participate provided a total of 494 students. The schools were assigned to either of the two test forms so that the number of students taking each form was approximately half the total number of students, 253 students and 241 students for Forms A and B, respectively.

The Iowa Food and Nutrition Test consisting of 60 items was constructed based on the item analysis data from the two test forms. A reliability estimate of .85 was calculated using the Spearman Brown split-half formula.

The test covered three content areas: physical, social, cultural and psychological aspects of food, consumer aspects, and food preparation and management.

An average difficulty for the test was .61 with 1.00 indicating the easiest item. However, the food and management area had difficulty indices above the .61 level. The researcher concluded this difference was due to the larger amount of instruction in the area. She attributed the other areas difficulty levels of less than .61 to reflect a more limited emphasis given to the areas.

Sand (1980) used items from three sources in constructing the 40-item knowledge instrument which assesses parenthood knowledge. The sources were Gruber (1979), the University of Minnesota (Note 4), and the Ohio State University (Note 4). The development of the Parenthood Test was considered to be one step toward meeting the mandate for a comprehensive evaluation of consumer and homemaking programs specified in Public Law 94-482.

In her study, the 40-item Parenthood Test assessed the level of parenthood knowledge among two groups of Iowa high school students. One group was the students who had completed a semester length child development course. The comparison group was students who had not taken a child development course.

She used an attitudinal instrument to assess attitudes concerning parenting. This instrument was administered to the same group of students. The achievement and attitude instruments reflected the 20 topics identified by the American Vocational Association Ad Hoc Research Committee (Note 5).

For this study, the responding sample consisted of 268 child development students and 187 non-child development students as a comparison group.

Sand reported discrimination indices ranging from .10 to .57. The difficulty levels were between .33 and .86. Using the Kuder-Richardson Formula 20, the reliablity estimate was .84. The standard error of measurement was 3.8. Based on the item analysis data the knowledge section was determined to be an acceptable instrument.

The analysis of the results of the 40-item knowledge section of the Parenthood Test showed that child development students had a mean score of 24.54 and a standard deviation of 6.91. The comparison group had a mean score of 23.43 and a standard deviation of 5.72. Scores of child development students ranged from 6 to 39. The range of scores for the comparison group was narrower, 7 to 33. An equal or higher percentage of child development students than the comparison group

answered 28 of the 40 items correctly. Of the 40 items, 12 were answered correctly by a higher percentage of the comparison group than of the child development group.

Significant differences in knowledge section scores were found between males and females, between grade levels, between schools, and between students who had taken a comprehensive home economics course and those who had not.

Significant differences in attitudinal factor scores for all five factors were found between schools, amount of experience with children, and type of experience with children. Females were found to be both more knowledgeable and feel more capable. Results indicated that child development students felt more capable concerning every parenting concept than students in the comparison group.

Cogle (1977) conducted a study in which she developed, tested, and administered an evaluation device for assessing the effectiveness of consumer education programs in Florida secondary home economics programs.

The researcher developed a questionnaire which was used to identify the scope of coverage of selected consumer education concepts to ascertain the availability and utilization of resources, and to determine how much emphasis was given to the cognitive, affective, and psychomotor domains (Cogle, 1977, pp. 29-30). From various sources, the researcher formulated a bank of 218 test items. Through pilot testing and revision based on item analyses, a final item bank of 82 multiple choice, criterion-referenced items were available. From this, two 40-item tests

were constructed. An additional nine items from the affective domain were added to each test.

The total sample for this study consisted of 1567 high school students enrolled in a semester consumer education course in home economics. The experimental group was composed of 20 classes with 457 students who had completed a semester consumer education course and the control group consisting of 1110 students from 49 classes who were beginning a semester consumer education course.

The test mean for Test A was 24.35 for the experimental group and 23.33 for the control group. The test mean for Test B was 25.26 for the experimental group and 24.77 for the control group.

Cogle drew several conclusions in reference to the achievement test. First, test items specifically developed for a semester home economics course in consumer education are effective in relation to content validity and reliability. Secondly, multiple choice items specifically developed for a semester consumer education course in home economics were effective in relation to format, stem design, and distractor design. And third, students who had taken a semester consumer education course in home economics obtain a higher mean test score than students who had not taken the course.

Crawford (1980) conducted a study to develop and implement a plan to assess participant outcomes of Iowa secondary vocational homemaking programs with emphasis on consumer education. She defined outcome as those knowledge, attitudinal, intent, and behavioral items which show

differences between homemaking and non-homemaking students and those consumer outcomes from programs identified by students.

Two instruments were used by the researcher, the Consumer Education Inventory and an achievment test. Crawford used items from Harder's (1979) norm-referenced test to form what Ahmann and Glock (1981, pp.20-21) define as an objective-referenced test. The test was administered to a stratified random sample of Iowa vocational home economics students.

Crawford found in analyzing the achievement test data that the homemaking and non-homemaking students had overall means of 22.1 and 21.9 out of 30. For her data, the knowledge component showed no significant differences either for the total score or for individual item scores. She concluded that the performance of both groups on the test was basically the same. In concluding her study, Crawford stated that student knowledge was an important outcome of programs, however other areas should be assessed as a basis for program assessment.

Data from existing studies on the effectiveness of consumer and homemaking education programs, support the belief that these programs are useful in helping to alleviate problems which are specific to the subject-matter areas of consumer and homemaking education programs. However, the literature suggests that information on the comprehensive knowledge of consumer and homemaking education students is needed.

Overview of Classical Test Theory Model

Education and psychological measurement are typically concerned with inferring a person's standing on some latent variable from his/her responses to a set of items (Noack, 1973). With few exceptions, the model on which such inferences are based is the classical test theory model (Lord & Novick, 1968). In this model, the true score of a randomly selected person on a measurement is conceived as independent of an observed-score random variable defined over some population of interest (Noack, 1973). An observed test score X is the sum of two components: A stable T and a random error score E. The model can be expressed as: $X = T + E$. The expected value (population mean) of X is T where T is defined as the mean of the theoretical distribution of X scores that would be found in repeated independent testings of the same person with the same test (Allen & Yen, 1979, p. 60).

The expected value of the error score over persons, the correlation between the true and error score on the same measurement, and the correlation between the error scores on the same and on distinct measurements are assumed to be zero (Noack, 1973).

True scores and error scores are unobservable theoretical constructs. Only X's can be observed. To draw inferences about true scores (T), it is necessary to use the observed test scores. The observed scores differ from true scores only because of errors of measurement; therefore, one can be interested in the observed scores only insofar as they provide information about true scores (Lord, 1967).

When making inferences based on tests constructed using the classical test theory model, the inferences are valid only for that sample. In this model, all items and test parameters depend upon the distribution of the attribute or trait to be measured in the sample of persons selected. Any new set of items chosen to compare test scores of individuals or groups on that new measure with their performance on a previous test measuring the same attribute or trait requires the establishment of norms based on the same population (Noack, 1973).

Persons responding appropriately to the same number of items in a test receive the same score, even though their patterns of responses to the items are not the same (Noack, 1973). Thus, the observed score may not contain all the information provided by the responses of a person to the items.

Inferences based on classical test theory are restricted to a specific population of examinees. The reliability of the test is defined depending on the particular group of examinees (Samejima, 1976). Some researchers believe that the assumptions on which classical test theory is based are rather weak and allow only weak inferences unless additional assumptions are made (Noack, 1973; Samejima, 1976). However, Nunnally (1978) and other researchers relate that tests designed using classical theory are highly robust when application of the theory departs from the assumptions.

Only recently has the general validity of classical test theory been questioned. This has been due to the investigation and development

of measurement models based on stronger assumptions (Lord, 1967; Lord & Novick, 1968; Wright & Panchapakesan, 1969; Whitely & Davis, 1974; Rentz, 1975). One such investigation has been that of studies relating to latent-trait test theory models.

Brief History of Latent-Trait Models

Noack (1973, p. 20) stated that latent-trait models have their roots in both psychological scaling and biological testing. Scaling has been applied to physical or psychological stimuli, either directly by rating methods or indirectly by estimating one or more parameters of a scaling model. Probabilistic models have been used to a large degree in biological tests to relate various types of responses. Scaling and biological test models are similar to latent-trait models in that stimulus parameters are to be estimated. However, scaling and biological test models do differ from latent-trait models in that no parameters are to be estimated that correspond to latent ability.

Latent-trait theory assumes that observable behavior can, to a considerable degree, be accounted for by constructs called latent-traits (Noack, 1973). A theory of latent-traits assumes that in testing situations, examinees' performance on a test can be explained by defining characteristics of examinees (traits), estimating scores for examinees on these traits, and using the scores to predict or explain test performances (Lord & Novick, 1968).

Lord's (1952) monograph represented the first complete account of a test theory based on the normal ogive model. In this test theory, he

assumed that ability follows a normal distribution and that the matrix of tetrachoric inter-item correlations is rank one. The latter assumption results when only one factor can be obtained from the solution of the matrix. Using actual data he found that observed and predicted score distributions agree quite well. Later, Lord (1953) introduced a general method for maximum likelihood estimation of item difficulty and item discrimination parameters, and latent ability assuming there was no guessing. During that same period, Lord suggested that this type of approach allows sample-independent item calibration and ability estimation, and that the scale for latent ability had a well defined metric.

Birnbaum (1968, as cited in Lord & Novick, 1968) presented information on a latent-trait theory based on the logistic function. Birnbaum showed that the logistic function is the only function for which a weighted-sum score exists, that is a sufficient statistic for a person's latent ability, and weights independent of ability.

Rasch (1960, as cited in Lord & Novick, 1968) developed a model for test items with relevance to the behavioral and social sciences. The model devised by Rasch is a special case of Birnbaum's logistic model. Rasch's one-parameter logistic uses the term item easiness. Because this dissertation is an application of the Rasch model, a section will be devoted to a discussion on this topic.

Hambleton and Cook (1976, Note 6), as well as other researchers, have addressed three notions in the general theory of latent-traits. They

are dimensionality of the latent space, local independence, and item characteristics curves.

Hambleton and Cook (Note 6) stated that the dimensionality of the latent space refers to the number of latent-traits that underlie the performance on a test by an examinee. Usually, it is assumed that the latent space is unidimensional, that is, items in a test are homogeneous in the sense of measuring one's ability of latent-trait.

The second notion in latent-trait is the principle of local independence. Allen and Yen (1979, p. 241) define local independence of items to mean, for a latent-trait value, that item scores are independent of one another. They stated that when two items are locally independent, the probability that an examinee with a latent-trait value passes both items is the product of the probabilities that the examinee passes each item. However, local independence of items does not mean that the items will necessarily be independent when the scores of examinees with a variety of latent-traits are pooled together.

Hambleton and Cook (Note 6) addressed local independence as being identical to the unidimensional latent space. They stated that by saying a single ability accounts for examinee performance on a set of items is the same as saying that for examinees at the same ability level, their item responses are statistically independent.

The final notion is an item characteristic curve. Nunnally (1978) defined an item characteristic curve or trace line as a graph showing the probability of making a particular response to a given item by

people having varying degrees of the attribute. Hambleton and Cook stated that the primary difference among various latent-trait models is the mathematical form of the item characteristic curve. The number of parameters needed to describe an item characteristic curve will depend on the particular latent-trait model. The number of parameters can be one, two, or three.

From the information on latent-trait theory, models based on this theory describe how the latent-trait influences an examinee's performance on each test item. Theoretically, latent-traits can have a value from negative infinity to positive infinity.

Latent-trait theory models have been used to deal with problems which arise in criterion-referenced testing and tailored testing. Hambleton and Novick (1973) suggested that because of a great many disconnected contributions, confusion over many basic problems in criterion-referenced testing exist. Problems are related to test development and test score use along with unique problems such as the establishment of cutting scores. In tailored testing, Hambleton and Cook (Note 6) believed that tests designed using classical test methods and administered to large groups of examinees will almost surely be too difficult for some examinees and too easy for others. When this occurs, the test will not discriminate effectively among either the high ability examinees or the low ability examinees.

In a 1977 article, Hambleton and Cook expressed the thought that latent-trait theory models could provide an excellent base for a theory

and practice of criterion-referenced testing. A criterion-referenced test was defined as a sampling of items from a well-defined domain of items measuring an instructional objective. The article related that a main use of a criterion-referenced test was to obtain an estimate of an examinee's level of ability on a objective. Thus, Hambleton and Cook suggested that a straightforward application of one of the latent-trait models (the assumption of unidimensionality would not likely be a problem) would produce examinee ability scores. From this application, they believed the advantages would be that the items could be sampled from an item pool for each examinee and all examinee ability estimates would be on a common scale.

One could construct criterion-referenced tests to "discriminate" at different levels of the ability continuum, since the item parameters are now invariant across groups of examinees. From this, they state that an easier set of test items might be selected for a pretest than a posttest, and one would still be able to measure examinee growth by existing examinee ability at each test occasion on the same ability scale.

Urry (1977) believes that tailored testing represents an effective application of latent-trait theory. In tailored testing, the examinee is presented a question by the computer, and the examinee gives an answer. When the answer is correct the examinee is given a more difficulty question; however, if the answer is incorrect, the next item is easier. With each response, a revised estimate of the examinee's ability is made. Each revision becomes more reliable. The examinee's

test ends when the estimate reaches a set level of reliability (Urry, 1977).

Urry suggests that tailored testing leads to improved measurement, compared to traditional paper-and-pencil testing under certain specifiable conditions. The conditions that ensure improved measurement are: (a) the use of appropriate latent-trait model; (b) appropriate selection of items for ability banks; (c) accurate estimates of item parameters for the appropriate model; and (d) efficient unidimensional and multidimensional procedures for the tailoring of tests.

From reviewing the information on latent-trait theory models, there is reason to believe that these models do add alternatives to theory of measurement. For instance one is able to measure the person and item on a common scale. And with latent-trait models, items which are not sample dependent can be developed which allow for tailored testing, item banking, and criterion-referenced testing. However, additional research is needed to gain the full usefulness of these models. For instance, researchers might use actual data rather than simulated data to examine item fit to the Rasch model.

Rasch Model

In the early 1960s, Rasch, a Danish mathematician, introduced a new approach to psychological tests. From this he developed probability models by means of which the contribution of the population could be eliminated (Rasch, 1960, as cited in Rasch, 1966).

The Rasch model makes it possible to take into account whatever abilities persons in the calibration sample happen to have and to free the calibration of test items from the particulars of these abilities (Wright & Panchapakesan, 1969). Therefore, no assumptions need to be made regarding the distribution of abilities in the target population or in the calibration sample.

Rasch (1966) listed three assumptions which are made in the model:

a. "For each situation in which a subject (s=1, 2 . . .n) has to answer an item (i=1, 2 . . .n) there is a corresponding probability of a correct answer (X_{si}=1) which is represented by

$$Pr\{X_{si}=1\}= \frac{\lambda\ si}{1 + \lambda_{si}} , (\lambda_{si} \geq 0)" \text{ (p. 50).}$$

b. "The situation parameter λ_{si} is the product of two factors,

$$\lambda_{si} = \pi_x\ \omega_i$$

where π_x equals the subject and ω_i the item" (p. 50).

c. "Given the values of the parameters, all answers are independent " (p. 50).

The assumptions that Rasch presented for his model can be stated in another way:

a. For each time an examinee responds to an item there is a corresponding probability that the examinee will respond with the correct answer.

b. For the situation parameter, it is composed of two components which are the subject's ability and the item.

c. With the values given for the parameters, the subjects answers to items are independent.

Through these assumptions, Rasch suggests that when data fit the model one will have a more objective test.

In recent years there has been increased interest in latent-trait theory and specifically the Rasch model. Rentz and Rentz (1979) addressed the issue of the Rasch model in an article written for practitioners. They wrote that the Rasch model specified that the probability of a person correctly answering a test item is a function of only two characteristics (parameters). They are the person parameter and the item parameter. The person parameter is defined as the amount of a particular characteristic the person possesses that enables him or her to answer questions like the ones that comprise the particular test. The item's parameter is defined as the point on the ability scale at which an examinee has a 50% chance of answering the item correctly (Brown, Note 2). With this occurring, the items and persons are measured on the same scale. Others define the Rasch parameter in terms similar to those presented by Rentz and Rentz (Hashway, 1978; Wright, 1967, Note 1, Samejima, 1976).

When discussing the item parameter, the factor of item difficulty invariance is important. Hashway (1978, p. 26) defined item difficulty invariance as the position of an item on the latent dimension and not as a function of the sample of subjects used to obtain estimates of that position.

Forster (as cited in Hashway, 1978) attempted to determine the minimum sized calibration sample necessary to obtain stable item difficulty estimates. His study was done using 1478 fourth grade and

1808 eighth grade students. The students had taken part in the Portland testing program in fourth grade mathematics and eighth grade reading. Five samples each of 50, 100, 200, and 300 subjects were randomly selected from each of the fourth and eighth grade populations. Rasch item difficulty estimates were calculated using each of the 20 samples within each grade and the total populations for each grade as calibration groups.

The Pearson product moment correlation coefficient was used by Forster (as cited in Hashway, 1978). The product moment coefficient was calculated between calibration groups across items (the item was the unit of analysis). Correlations of item difficulty estimates between samples ranged from a low of .95 to a high of .99. The average correlation was .98. The largest fluctuation in item difficulty estimates were with calibration samples of between 50 and 100 subjects. His results indicated that sample sizes of 150 to 200 subjects are required to obtain stable item difficulty estimates.

Rentz and Rentz (1979) studied varying sample sizes and reported that if one is trying to calibrate items that will appear in several places then one wants to be sure the estimates are stable; for example, when constructing various forms of a test from an item bank. Their study showed that sample sizes of 500 to 1000 would be preferred for a case of this nature. They related that with a sample size of more than 1000 not much is gained in stability relative to the investment it takes in additional data.

Wright (Note 1) stated when measurement is governed by the Rasch model, it is possible to take into account whatever abilities the persons in the calibration sample happen to have and to free the estimation of item easiness from the particulars of these abilities. He concluded that the scores persons obtain on the test can be used to remove the influence of their abilities from the item analysis, whereby the result is a person-free test calibration.

Wright asked two questions: (1) "Can test calibration really be independent of the ability characteristics of the persons used to make the calibration? and (2) Can person measurement, the estimation of a person's ability from a score on some selection of test items, really be independent of those items used for the measurement" (1967, p. 89).

To address the two questions, Wright used data from the responses of 976 beginning law students to 48 reading comprehension items on the Law School Admission Test. Taking the 325 students who did the worst on the test and the 303 students who did the best, he examined the effects of the abilities of the law students on the test calibration. From his analysis, it was seen that when examinees had the same total score, the persons differed on items which they succeeded.

To judge whether person measurement can be independent of item selection, he divided the 48 items on the test into two subtests of 24 items each with no items in common between them. The 976 law students' test scores on the 48 items were divided into subscores on the Easy Test (24 easiest items) and Hard Test (24 hardest items).

This gives each student a pair of independent scores, each of which should provide an independent estimate of his reading comprehension ability. After conversion to ability measures on a common scale, the calibration curves were calculated for each of the subtests. Based on the item analysis model, if the data fit then the independent results from two different tests should produce statistically equivalent ability estimates. The Easy Test and the Hard Test produced statistically equivalent ability estimates.

In 1973, Noack conducted a study to investigate the validity of the one-parameter (Model 1, Rasch), two-parameter (Model 2), and three-parameter (Model 3) latent-trait models, and to draw some inferences with regard to their utility by applying them to data collected on six parallel forms of the ACT Mathematics Usage Test. Since Models 2 and 3 not only present difficulties in estimating the item parameter and ability, they also involved high computer cost. Noack presented a more detailed analysis of the Rasch model than of Models 2 and 3. Subsequently, two consecutive studies were planned: The first, dealing with the investigation of the Rasch model, and the second, dealing with a less elaborate comparison of the three models.

The Mathematics Usage Test consisted of a 40-item, 50 minute examination which purported to measure the student's mathematical reasoning ability. Upon inspection of the instrument by Noack, he indicated that quantitative reasoning problems, problems in geometry, first year college algebra, and advanced arithmetic were included in

the test. From that inspection, he related that the Mathematics Usage Test may not measure a single latent variable.

For Noack's study, parallel forms of the tests were carefully matched on content, average item difficulty, and item discriminating powers. Students taking the ACT test battery are usually high school seniors seeking admission into college. Forms 10A, 10B, and 10C were administered to a group of 5915 students and Forms 12A, 12B, and 12C to 6468 students. For each form of the test, specific name was not given for the subtest rather number and letter notation. The testing was done October 1968 and October 1970, respectively. During both testing periods, the three parallel forms were given within test centers randomly assigned to examinees.

When looking at the distribution of and relationship between the ability estimates, Noack found that the relationships among the observed scores and ability estimates under the three models were all larger than 0.96. He also reported that Model 1 and Model 2 ability estimates were almost linearly related, γ=0.99. Based on several analyses made by Noack, it was indicated that Model 1 ability estimates were relatively robust with regard to violations of some of the assumptions. There was evidence that the assumption of equal units was approximately met and that examinees tended to omit substantial numbers of items.

In looking at the efficiency and precision of measurement, Noack found that on overall efficiency Model 1 and Model 2 were about the same. It was determined by the study that Model 1 was more efficient than Model 2 for ability estimates below the mean whereas Model 2 was

more efficient than Model 1 for abilities above the mean. Also, the error associated with an observed score or ability estimate is very different for the models.

Noack reported in his study that the estimates of latent ability under Model 1 were found to be surprisingly invariant with respect to the difficulty of the tests on which they were based. The Model 2 ability estimates were found less invariant than ability estimates for the Rasch model.

The chi-square measure of goodness-of-fit used by Noack indicated that Model 1 provided the poorest fit of the three models and Model 3 the best fit. There appeared to be little difference between Model 1 and 2. When looking within a test, the item chi-square indices of goodness-of-fit under Model 1 were found to be related to item discrimination such that items high or low in discriminating power had higher chi-square indices than items with moderate discriminating powers. This relationship was not found to exist for Models 2 and 3.

In concluding the study, Noack stated that it seemed that the Rasch model, though not adequate since it does not fit data provided by tests of ability and achievement, is clearly superior to the classical test theory model. Noack also pointed out that because of computational difficulties and the requirement of a very large sample, the use of Models 2 and 3 is precluded. Finally, he stated that the Rasch model should no longer be thought of as a research tool in the hands of the psychometrician but as a tool useful for application where large scale testing occurs (p. 175).

Rentz (1975) conducted a study to examine the invariance properties of Rasch model item parameter estimates across calibration situations characterized as varying with respect to model-data fit and calibration sample composition. For her study, Rentz gathered item responses to a 45-item test for 30 calibration situations. These simulated data were generated according to specifications as to true score distribution, person ability associated with each true score, sample size, type of model-data fit, and item easiness. Each set of item responses was separately analyzed, and the analyses provided sets of Rasch model parameter estimates corresponding to each calibration condition.

For Rentz's study, five distribution shape conditions were chosen: normal, negative skew, positive skew, bimodal, and rectangular. Variation in the calibration sample characteristics was defined in terms of variation in the shape of the true score distribution of the sample used for estimating parameters. The distribution shape was varied by manipulating the proportion of persons included in the sample at each true score value for the 45-item test. The total sample size for all conditions was held constant at 3200.

Based on the data in the study, Rentz stated that it is probably not necessary to recalibrate fitting items after eliminating nonfitting items from a test. She continued by saying that the data in the study suggested that test fit cannot be adequately defined in terms of the percentage of nonfitting items.

Hashway (1977) conducted a study to investigate four questions: "(1) Are scores obtained for individuals using Rasch tests invariant to variations in the item composing the tests, and the group of subjects used to calibrate the item? (2) Do tests constructed using Rasch or traditional techniques rank order subjects or classes in similar ways? (3) Are there psychometric or substantive differences between items selected from the application of the Rasch or traditional item selection technique to the same, previously unscreened item pool? and (4) Are the items selected by the Rasch technique from an item pool which has not received a previous psychometric screening significantly different from the item selected by the technique from a traditionally prescreened item pool?" (p. 132).

His sample was composed of 2557 sixth standard and 1607 post-primary one students in Ireland. The instrument used was the Drumcondre Criterion-Referenced Mathematics Test which was administered in the fall and spring of 1973. The test consists of 155 items, each of which was associated with one of 55 objectives.

Based on the statistical analyses, Hashway concluded that Rasch item difficulty is invariant to changes in the calibration sample. He stated Rasch tests tended to rank order subjects in a fashion which was not similar to the way traditionally constructed tests rank order the same subjects. When Hashway compared items selected by the Rasch and traditional procedures to determine if they differed in terms of traditional item difficulty, it was found that the number of subjects who responded correctly to Rasch selected items was not significantly

different from the number who responded correctly to traditionally selected items. Finally, he concluded that there was a significant difference in the items selected by the Rasch technique from the unscreened item pool and the number of traditionally prescreened items satisfying the Rasch criteria.

On the basis of his work in using the Rasch model, Hashway suggested that the emphasis of further research on the Rasch model should be theoretical in nature. And the direction of that theoretical research should be purely mathematical rather than simulational.

Reckase (1980, Note 7) conducted a study to compare the one- and three-parameter logistic models for item calibration using five criteria: goodness of fit, the relationship of items to ability estimates, the validity of ability estimates, the sample required for calibration, and the comparability of ability estimates. Test data of three types were used: standardized tests, classroom tests, and simulation data. The standardized test selected was the Missouri version of the School and College Ability Test, verbal and quantitative subtests. The classroom tests used in the Reckase study were selected from those used to measure college students' knowledge of standardized testing procedures. The stimulated data were generated using a procedure developed by Wherry, Naylor, Wherry and Fallis in an earlier study. The Missouri School and College Ability Test and classroom tests were 50-item, multiple choice tests.

Sample sizes used were: 1000 cases generated for each of the eight simulated tests, 15,426 cases for the Missouri School and College Ability Test and 877 cases for the classroom test.

The results showed that the three-parameter model fit the data better than the one-parameter model, there was no difference in the predictive power of the ability estimates, and the one-parameter model required a smaller sample for item calibration.

Based on the results found in his study, Reckase made several recommendations on the use of the one- and three-parameter models. If one is interested in maximizing the statistical information when measuring an individual or accurately predicting individual item responses, the three-parameter model seems to be the method of choice, but the attainment of this greater information requires a considerably larger sample size. Also, in item banking and computerized test construction, the better fit of the three-parameter model to the data would seem to indicate a preference for that model. However, for fixed length tests where ranking on the ability estimates is the main consideration, the one-parameter model is preferred because of its smaller sample size requirements and because of its high correlation with the three-parameter ability estimates. If accurate ability estimation is required at the lower end of the ability range, the three-parameter seems to have the advantage.

Summary

The literature on the use of achievement tests in assessing the effectiveness of consumer and homemaking programs and latent-trait theory test models has been reviewed. Consumer and homemaking programs are effective based on information gathered from achievement testing and

several other sources of data collection. The tests used in the studies reviewed were developed using the classical test development theory.

The literature suggests that constructing achievement tests based on the assumptions of classical test theory provides means for making generalizations only about the specific examinees taking the test. This approach is widely used in large testing programs but latent-trait test theory may be more suitable for specific testing situations such as tailored testing. The literature reviewed suggests that latent-trait test theory models may provide a useful method for constructing tests by which one can make more generalizable inferences.

The Rasch model has been suggested by some researchers to be a latent-trait model well suited for alleviating some of the psychometric problems that exist when constructing tests. The parameters for this model are the person and the item. In this model, the probability of an examinee correctly responding to an item is a product of the person's ability and the item's easiness. There is no assumption made about the ability of the group in which the examinee is a member.

As shown by the review of literature, the Rasch model can be used to select items to be used in tailored testing and item banking. These two areas of testing are well suited for use in consumer and homemaking education, since there are times when the tester is not interested in giving examinees all items but some portion of items from a well defined domain.

METHODOLOGY

In the literature reviewed for this study, one sentiment regarding latent-trait test theory appeared a number of times. Some researchers (Hambleton & Cook, 1977; Rentz & Rentz, 1979) believed that too little attention has been given to applying various latent-trait models to actual data. This study was concerned with applying one latent-trait model to an existing data set. The data set was examinee's responses to a comprehensive consumer and homemaking achievement test.

Statement of the Problem

There exist studies which support the statement that there is a common body of knowledge which is taught at the secondary level of consumer and homemaking in Iowa and the United States (Hughes, Rougvie, & Woods, 1980 ; Note 8). Achievement tests provide an avenue for determining the knowledge level of those students who participate in consumer and homemaking education programs. As noted in the review of literature, there is a belief that tests can be developed which are invariant across samples. The purpose of this study was to use the Rasch procedure, a one-parameter latent-trait model of item calibration, in selecting consumer and homemaking test items.

Objectives

More specifically, the major objectives of the study were to calibrate the available pool of consumer and homemaking items using the Rasch procedure of item calibration which is one area of latent-trait

test theory, and to compile calibrated items in forms to be used by secondary consumer and homemaking teachers when assessing students achievement.

Assumptions

The assumptions affecting this study were that the students would answer the questions to the best of their abilities using knowledge acquired through participation in at least four semesters of consumer and homemaking education which covers the six content areas, the sample of secondary home economics students will contain some members who will not be enrolled in consumer and homemaking classes at the time the test is administered, and the students responses to items are the result of the student's ability and the easiness of the item.

Limitation

For this study, the limitation affecting it was the overall sample size in the study was sufficient for fitting items to the Rasch model, but the sample size responding to each of the five forms of the test is small and may not provide stable indices.

Description of Sample

The Iowa Consumer and Homemaking Evaluation Project began in 1978 and was to be conducted over a three year span. The project involved the evaluation of the consumer and homemaking education component of Iowa secondary vocational home economics programs. This study follows as a result of some earlier work relating to the Iowa Evaluation Project (Harder, 1979; Nece, 1979; Sand, 1980; Crawford, 1980).

The sample plan for the project was developed by the Iowa State Statistical Laboratory. The population for the studies to be conducted was schools offering vocational consumer and homemaking programs, or 242 school districts out of 445. The Iowa Department of Public Instruction (DPI) provided the laboratory with a computer printout with districts arranged according to enrollment figures.

A stratified random sample of schools was drawn based on the enrollment figures. Districts with the largest enrollment were automatically forced into the sample.

The selected schools were invited to participate in the evaluation project (See Appendix A). Of the invited sample, 101 districts and 157 schools agreed to participate in the study, at least for the first year. Schools were contacted for each phase.

In fall 1979, teachers in the sample were contacted and invited to participate in this phase of the project, the administration of a comprehensive consumer and homemaking education achievment test was given to 9-12 grade students who had had four or more semesters of home economics. The teachers were to explain that an achievement test would be administered in the spring of 1980. Lists of students from the teachers were returned to the researcher. The lists were the results of the students meeting the qualifications and agreeing to complete the achievement test. From the lists, a total of 1978 students agreed to participate.

Instrumentation

With the congressional mandate as additional stimulus, a group of concerned educators in home economics education established the American Vocational Association Ad Hoc Research Committee in 1977 (Ad Hoc Committee). This committee along with educators in the field encouraged evaluation studies in the various areas of home economics.

In preparation for a study to determine what was taught in secondary vocational consumer and homemaking education programs, it was necessary to develop a list of topics for the various areas included. A list of 120 topics was developed by teacher educators, teachers, subject-matter specialists, and the Ad Hoc Committee. They reviewed curricula materials, legislation and research. These sources gave credence to the selection of the 120 topics as being taught in consumer and homemaking education.

The comprehensive consumer and homemaking education (C&HE) test consists of items developed for earlier studies at Iowa State University and items adapted from other sources. The test covers six content areas: child development/parenting, food and nutrition, clothing and textiles, consumer education and management, family relationships, and housing/ home furnishings/equipment.

In constructing this test, items were selected from the existing tests covering the specific content areas. The available items reflected the emphasis of the conceptual areas established for the earlier study.

The items which made up the comprehensive C&HE test are the results of a series of test development efforts at Iowa State University and items selected from other sources. For most of the original tests, reliability coefficients, discrimination indices, and difficulty levels of items were available.

The selected child development/parenthood items were adapted from Sand's study (1980). Sand used items from three sources to construct the parenthood test. The sources were Gruber's Parenthood Education Knowledge Test (Gruber, 1979), items from the Ohio State University, (Note 4), and items from the University of Minnesota (Note 4). Sand administered the 40-item test to a sample of 286 secondary students. For this sample, the item difficulties were between .30 and .70 and discrimination indices ranged from .20 to .40. Using the Kuder Richardson Formula 20, the reliability coefficient was estimated at .84.

Harder (1979) provided items for the consumer education and management area. She administered a 50-item Iowa Consumer Education Test to a sample of 109 secondary students. For this test, the difficulty level of the items was between .30 and .70. The discrimination indices ranged from .20 to .40. Using the Spearman Brown procedure, the reliability estimate was .90.

Family relations and additional management items were adapted from items developed in a 1969 study by Hughes. She constructed two equivalent forms of the test, Form A with 47 items and Form B with 45. The discrimination indices for Form A were between .19 and .33 and for

Form B, .30 and .45. The levels of difficulty were between .38 and .66 and .46 and .56 for Forms A and B, respectively. The reliability estimates were .80 for Form A and .73 for Form B.

Nece (1979) generated a food and nutrition test which consisted of 60 items. Of these items, 12 were true-false and 48 multiple choice. For these items, item difficulty was between .30 and .70 and the discrimination ranged from .20 to .40. Using the Spearman Brown procedure, the reliability estimate was calculated to be .85.

The housing/energy items were taken from work by Njus (1977) and the Illinois Teacher (1979). Njus constructed a 26-item Energy Management Test and administered it to 177 examinees. For her test, the difficulty of the items was between .33 and .76. The item discrimination indices were between .12 and .54. Reliability of the test as determined by the Spearman Brown procedure was .64. Housing items were taken from the Illinois Teacher (1979). None of the three components for item analysis were provided nor was a reliability coefficient available. However, the items used from the Illinois Teacher had been reviewed by subject matter experts for content validity.

Amos and Woods (Note 3) constructed and validated 90 textile and clothing items. The reliability for the items was .94. From the 90 items, 40 items were selected with difficulty levels of .30 to .70 and discrimination indices between .20 and .40.

From the tests for the six content areas, selected items were placed in an item pool which was used in the construction of the comprehensive consumer and homemaking education test. Since the number

of items was large (230), it was not feasible for each student to respond to a test of such length. The items from each content area were randomly selected and placed in one of the five forms. Though not equivalent, the five forms represented a manageable system for acquiring responses to each item.

Each form of the test consists of 46 items with each content area having 8 items except for family relations and management of resources which had 6 items. For each form of the test, items 1-8 measured food and nutrition concepts, 9-16 measured textiles and clothing concepts, 17-24 measured consumer education and management concepts, 25-30 measured family relationships concepts, 31-38 measured child development/parenting concepts and 39-46 measured housing/home furnishings/equipment concepts. But in Form D, items 20-22 measured family relationships concepts and items 25, 27, and 28 measured consumer education and management concepts. An example of a description of topics and item numbers for Form A is found in Table 1. Forms B, C, D, and E are included in Appendix B.

Data Collection

Particular to this study, achievement data were collected from C&HE students across the six content areas. The teachers received letters explaining the second phase of the study. Included in the same letter was a note asking the teachers to send a list of their consumer and homemaking students who had completed 4 or more semesters of C&HE.

In spring 1980, each teacher was sent a packet of testing materials containing a cover letter, achievement tests and a stamped self-addressed envelope for returning the tests. The teachers were requested to administer the tests to the list of students who had agreed to participate.

Table 1. Table of specifications - Form A

Content Area	Item Numbers
FOOD AND NUTRITION	
Reliable sources of nutrition information	1
Food preparation	2, 3
Special food requirements for individuals	4
Labeling and food standards	5
Influences of family values and custom on food patterns	6
Factors involved in food planning	7
Weight control	8
CLOTHING AND TEXTILES	
Fiber characteristics	9
Human/nonhuman factors influencing decisions on textile products	10
Color, line and design	11, 16
Construction skills	12, 15
Evaluation of apparel quality	13
Consumer rights	14
CONSUMER EDUCATION AND MANAGEMENT	
Financial planning	17, 19, 22
Pricing	18
Management process/practices	20, 23
Resources	21
Decision making	24

FAMILY RELATIONSHIPS

Problem-solving/decision making	25, 26, 30
Changing roles of individuals in families and society	27
Communication and interaction skills	28, 29

CHILD DEVELOPMENT/PARENTING

Intellectual development	31
Birth of the baby	32
Physical growth and development	33, 35
Environmental consideration of parenting	34
Maternal health and nutrition	36
Health and nutrition of children	37
Creative expression of development	38

HOUSING/HOME FURNISHING/EQUIPMENT

Factors influencing furnishing decisions	39, 42
Legal aspects of housing	40, 43
Factors influencing housing decision	41
Selection, maintenance and care of housing, furnishings and equipment	44
Function of housing	45
Factors influencing furniture arrangement	46

The tests were administered to the students during regular class time. Approximately 50 minutes were used to complete the test. The students were instructed to fill out the demographic information on the cover sheet of the test.

For this study, there were five forms of the test. Each student responded to one form. Within any class, all forms of the test may have been given, but in some classes there were not sufficient students such that all forms were given in that school.

After the students completed the tests, the teachers returned them to the researcher by mail.

Data Analysis

In this study, packages of tests were received at intervals from the participating schools. Information from the tests was put on IBM scan sheets by hourly workers. Since the data from the tests were to be used in several studies, each student's test had an eight digit code number which was used for identification.

BICAL developed by Wright and Mead (as cited in Wright, Mead, & Bell, 1980) was used to analyze the five forms of the comprehensive C&HE achievement test. The BICAL program estimates items parameters and tests the reasonableness of the hypothesis that all items are useful members of a single measurement class (Wright, Mead, & Bell, 1980).

Based on information from Research Memorandum Number 23C (Wright et al., 1980), BICAL consists of three major sections, input, estimation, and fit. From the input section, control cards are read,

person records are processed, records are stored for fit analysis and the item and person marginals for the estimation section are computed. Involved are sub-routines PAGE, REDØP, and EDITD.

In the estimation section, the sub-routine ESTIM which includes calls to PRØX, UCØN, and ABILITY are controlled. From these routines, the estimates of ability and difficulty are calculated for the marginal person and the item score distribution.

"The parameter estimates from ESTIM and the person file prepared by REDØP are combined into an analysis of the fit of the data in sub-routine FITCS" (Wright et al., p. 63). From the FITCS sub-routine, a mean square test of fit for each item is computed, then the sub-routine organizes the results for SMMRY, which prints the fit summary table.

When determining the reasonableness of item fit to the Rasch model, several generated item fit statistics can be interpreted. These include: (1) error impact, (2) person separability index, (3) total t fit (t-test total), (4) between group t (fit between), and (5) discrimination index. Additional information can be gathered by examining the following: (1) the Item Characteristic Curve panel, (2) the departure from expected Item Characteristic Curve (ICC) panel, and (3) the map showing the distribution of items and persons.

In the Rasch model, "the mathematical units for the person and the item parameters are called logits" (Wright & Stone, 1979, p. 17). Wright and Stone provide a complete explanation of the person logit and item logit.

An estimate of the proportional error increase which could be due to the misfit of the item is expressed as the "error of impact" (Wright et al., 1980, p. 83). This item statistic is based on the weighted mean square. Wright et al., noted that there is an increase in the error of impact away from a reference point of 1.0 as the observed Item Characteristic Curve departs from the expected ICC. This problem occurs when too many high ability examinees fail on easy items or when too many low ability examinees succeed on difficult items. When the weighted mean square is 1.0 or less, error impact is 0.0. However, when the weighted mean square is above 1.0, error impact increases in proportion to the difference between the square root of the weighted mean square and one (Wright et al., p. 83-84).

The "person separability index" is equivalent to a reliability coefficient, Kuder-Richardson 20. Using BICAL, this index calculated by "forming the ratio of the sample sum of squared measure error to the sample sum of squared measure deviations and subtracting this ratio from one" (Wright et al., 1980, p. 77).

The "total t fit (t-test total) evaluates the general agreement between the variable defined by the item and the variable defined by all other items over the whole sample" (Wright & Stone, 1979, p. 53). A more complete presentation of the total t statistic can be found in Wright and Stone (1979) and Wright, et al. The reference values for the total t fit is a means of Ø and a standard deviation of 1.0.

On the input description card for CFIT, which controls the screening of the person file before recalibration, a value is specified. When persons total t-fits are above the specified value on the CFIT

card, these persons are eliminated from subsequent analyses. The value is usually specified to be 2.0.

The "discrimination index describes the linear trend of residual departures from model expectation across ability groups, expressed around a model value of 1.0" (Wright et al., p. 84). They noted that when the discrimination index is near 1.0, the observed and expected ICC's are close together. They continue by noting, when the index is much less than 1.0, the observed ICC is flatter than one expects. This means that the "item in question is failing to differentiate among these abilities as well as other items do" (Wright et al., 1980, p. 84).

It was stated by the previous authors that when the discrimination index is much greater than 1.0, the observed ICC is steeper than the average best fitting logistic curve for all items (p. 85). From this, the item gives the appearance of differentiating abilities more effectively than the average item in the test.

Wright et al. (p. 84) stated that "the between group t (fit between) evaluates the agreement between the observed ICC and the best fitting Rasch model curve, as estimated by the ability groups." The reference values for the t statistics are a mean of 0.0 and a standard deviation of 1.0.

Together with the abovementioned statistics, three more points can be addressed which add to the information on the items and the persons.

In the Item Characteristic Curve panel, the proportion of correct answers given by each ability group to each item is presented. At the

bottom of the panel, the score range and mean ability are given for each ability group. The panel allows one to inspect beginning on the left side, the poorest group, to right side, the best group. The ICC is expected to increase as you move from left to right (Wright & Stone, 1979 p. 53).

The panel showing the departure from expected ICC gave information on the proportional departures of the observed ICC's , as found in the ICC panel, from the expected ICC's predicted by the Rasch model. In this panel, one can inspect where the proportional departures and the direction in which they occur (Wright et al., 1980, p. 83).

Finally, the BICAL program produces a map showing the distribution of items and the persons. The map is presented such that its central column is labeled measure midpoint. The midpoints increment by 0.2 logits, so that each midpoint covers a range of 0.2 logits (Wright et al., 1980, p. 79).

When applied to the persons the measure midpoints refer to person and the information in the parentheses their standard errors (Wright & Stone, p. 78). However, if applied to the items, they refer to item difficulty (Wright & Stone, 1979, p. 78). The standard errors do not apply to the items.

From the map, the level of the items is readily available for inspection. Therefore, one can directly compare person ability with level of item.

This discussion has presented the essential points which appear to be useful when selecting items for inclusion in tests. These points

provide a clear picture of how the examinees and the items compare on a common scale.

Final Test Form

The comprehensive consumer and homemaking test was administered in five forms to a sample of secondary home economics students with four or more semesters of consumer and homemaking education. The examinees' responses were calibrated using the Rasch model of test calibration. Items which did not fit the expectations of the model were deleted and not considered for inclusion in the final form of the test.

The test constructed from the calibrated items was reflective of the judgmental decisions made by the researcher. With a table of specifications based on the topics emphasized in the National Census Study of Secondary Vocational Consumer and Homemaking Programs (Hughes et al., 1980), the researcher used this information and the difficulty of the items to build one test which reflected the topics considered to be important in consumer and homemaking education

To maintain continuity within the test, the test items were arranged by content areas. They appeared in the following order: food and nutrition, clothing and textiles, consumer education and management, family relationships, child development/parenting, and housing/home furnishings/equipment. Items in each content area were ranked from least difficulty to most difficulty. The comprehensive test was presented to show the topics measured in each content area, the items and the original test form, and the difficulty of the items.

RESULTS AND PRESENTATION OF FINAL TEST

Introduction

The purpose of this study was to use the Rasch procedure of item calibration in selecting consumer and homemaking test items. The pool of items was calibrated using version three of BICAL, a computer program for fitting data to the Rasch model (Wright, et al., 1980).

The results are reported in detail for Form A and summarized for the other forms. Five item statistics, error impact, person separability, total t fit (t-test total), between group t (fit between), and discrimination index are discussed. In addition, the Item Characteristic Curve, the departure from expected ICC, and the map showing the distribution of items and persons are discussed.

For each test, the number of examinees differed. With each additional computer analysis, some examinees were deleted due to their unlikely patterns of response.

Initially, each form of the test had 46 items. However, this number changed once the first computer analysis was completed and the researcher inspected the items. The items were inspected based on the five item fit statistics and the three additional characteristics.

Results of Form A

Form A began with 203 subjects and 46 items. On the first analysis, there were no examinees with scores below 1 nor above 45. So at that stage, no subjects were deleted.

In Table 2 the conversion of person scores to estimated person ability scores (log ability) and the standard errors of measurement for the ability scores are presented. For instance, on Form A a raw score of 32 is a person ability score of 1.02 with a standard error of .35. There were nine examinees at this point. The test characteristic curve shows a cumulative distribution from the lowest ability score, -4.30 to the highest, 4.18. As stated by Wright et al. (1980), the test characteristic curve shows the extent to which the relationship between score and measure is nonlinear.

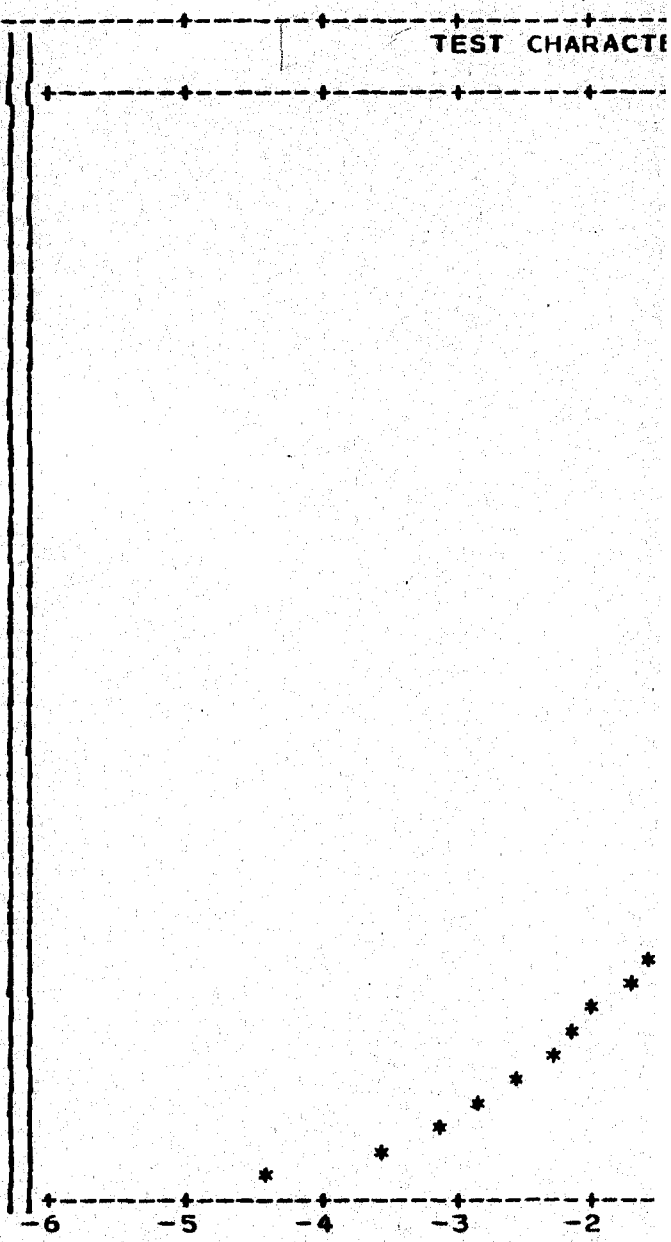
On the bottom of Table 2, the person separability index is indicated. For Form A, this index is .70. The person separability index is equivalent to Kuder-Richardson Formula 20.

As mentioned in the methodology section, the measure midpoint is the measure of person ability and the item difficulty with standard error for the person ability in parentheses (Table 2). Here, the item difficulties and person abilities are put on the same scale. A mapping of items and persons are shown in Table 3. Person abilities are transformed estimates of raw scores ranging from 4 to 40 into logits and ranging from -2.70 to 2.30 with accompanying standard errors of measurement.

In Table 3, it is seen that the most difficult item is 25 which had a difficulty of 2.30. On continued inspection items 36 and 43 are also difficult items. The three items had difficulties above the person ability estimates of the six examinees scoring the highest raw score. There were 36 items which fell within plus or minus 2

TABLE 2. COMPLETE SCORE EQUIVALENCE

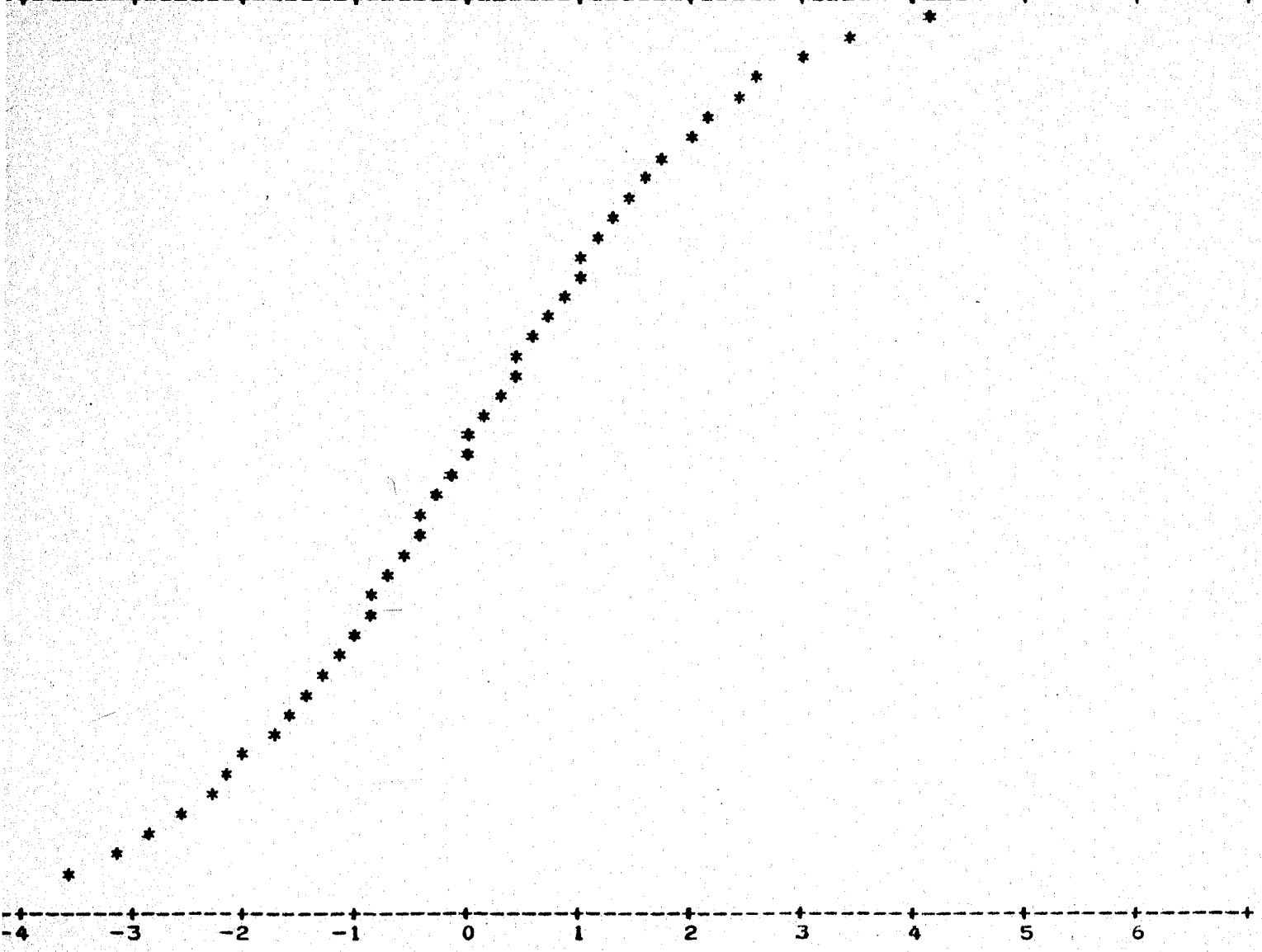
RAW SCORE	[1]COUNT	[2]LOG ABILITY	STANDARD ERRORS
45	0	4.18	1.03
44	0	3.46	0.74
43	0	3.02	0.62
42	0	2.70	0.54
41	0	2.43	0.50
40	0	2.21	0.46
39	0	2.02	0.43
38	0	1.84	0.41
37	0	1.68	0.40
36	0	1.54	0.38
35	2	1.40	0.37
34	4	1.26	0.36
33	6	1.14	0.36
32	9	1.02	0.35
31	7	0.90	0.34
30	11	0.78	0.34
29	21	0.67	0.34
28	12	0.56	0.33
27	12	0.46	0.33
26	13	0.35	0.33
25	18	0.24	0.33
24	11	0.14	0.33
23	9	0.03	0.33
22	14	-0.07	0.33
21	10	-0.18	0.33
20	9	-0.29	0.33
19	5	-0.40	0.34
18	9	-0.51	0.34
17	7	-0.62	0.34
16	2	-0.74	0.35
15	3	-0.86	0.35
14	2	-0.98	0.36
13	3	-1.11	0.37
12	1	-1.24	0.37
11	1	-1.38	0.38
10	1	-1.53	0.40
9	0	-1.69	0.41
8	0	-1.86	0.43
7	0	-2.05	0.45
6	0	-2.25	0.48
5	0	-2.49	0.51
4	1	-2.77	0.56
3	0	-3.11	0.63
2	0	-3.56	0.75
1	0	-4.30	1.04



PERSON SEPARABILITY INDEX 0.70 (EQUIVALENT TO KR20)

[1] 46 ITEMS CALIBRATED ON 203 PERSONS
[2] 203 MEASURABLE PERSONS WITH MEAN ABILITY = 0.21 AND STD. DE

TEST CHARACTERSTC CURVE



KR20)

0.21 AND STD. DEV. = 0.52

TABLE 3. MAP OF VARIABLE

PERSON STATS	COUNT [2]	RAW SCORE	MEASURE MIDPOINT(S.E.)	ITEM [1] COUNTS	TYPICAL ITEMS		(BY N
+4SD		40	2.30(0.46)	1	IT25		
		39	2.10(0.43)				
		38	1.90(0.41)				
+3SD		37	1.70(0.40)	1	IT43		
		36	1.50(0.38)	1	IT36		
+2SD	6	34	1.30(0.36)	4	IT16	IT17	IT41
	15	32	1.10(0.35)	2	IT29	IT44	
	7	31	0.90(0.34)	1	IT11		
+1SD	32	29	0.70(0.34)	2	IT20	IT26	
	24	27	0.50(0.33)	8	IT08	IT10	IT15
MEAN	31	25	0.30(0.33)	2	IT12	IT14	
	20	23	0.10(0.33)	2	IT05	IT30	
	24	21	-0.10(0.33)	3	IT21	IT22	IT40
-1SD	14	19	-0.30(0.34)	5	IT13	IT23	IT24
	9	18	-0.50(0.34)	3	IT09	IT31	IT38
	9	16	-0.70(0.35)	2	IT03	IT04	
-2SD	5	14	-0.90(0.36)	2	IT02	IT28	
	3	13	-1.10(0.37)				
-3SD	2	11	-1.30(0.38)				
	1	10	-1.50(0.40)	3	IT07	IT18	IT42
		9	-1.70(0.41)				
-4SD		8	-1.90(0.43)	1	IT45		
		7	-2.10(0.45)	1	IT34		
-5SD		6	-2.30(0.48)	1	IT01		
		5	-2.50(0.51)	1	IT06		
	1	4	-2.70(0.56)				

[1] 46 ITEMS CALIBRATED ON 203 PERSONS
[2] 203 MEASURABLE PERSONS WITH MEAN ABILITY = 0.21 AND STD. DEV

CAL ITEMS (BY NAME)

IT17	IT41	IT46				
IT44						
IT26						
IT10	IT15	IT19	IT27	IT33	IT35	IT39
IT14						
IT30						
IT22	IT40					
IT23	IT24	IT32	IT37			
IT31	IT38					
IT04						
IT28						
IT18	IT42					

I AND STD. DEV. = 0.52

standard deviations (SD) of the mean. Seven items fell between -3 SD and -5 SD. They are items 7, 18, 42, 45, 34, 1, and 6.

On the input description card, the CFIT value was set at 20 which controls the screening of the person file before recalibration. In order to eliminate from calibration examinees with total t fits of 2.0, the set CFIT value is divided by 10. Therefore, any examinee whose total t fit is greater than 2.0 will be eliminated for misfit.

Using a total t fit of 2.0, there were seven persons omitted from the recalibration (Table 4). It can be seen that these examinees have person ability measures which were low, from .14 to -1.53. The seven persons have total t fits ranging from 2.02 to 4.16. Responses and standardized residuals are given. A large negative residual means the examinee should had responded correctly and a large positive residual means the examinee should had responded incorrectly to the item. Therefore, the larger the residual the more unlikely the response. For instance, the response of person 20811611 to item 1 was more unexpected than his/her response to item 2.

A pictorial representation of fit t test by person ability is in Graph 1. Looking at the vertical axis, it can be seen that some examinees are above the total t value of 2.0. As shown by Table 4, there were seven examinees with total t values of 2.0 or above.

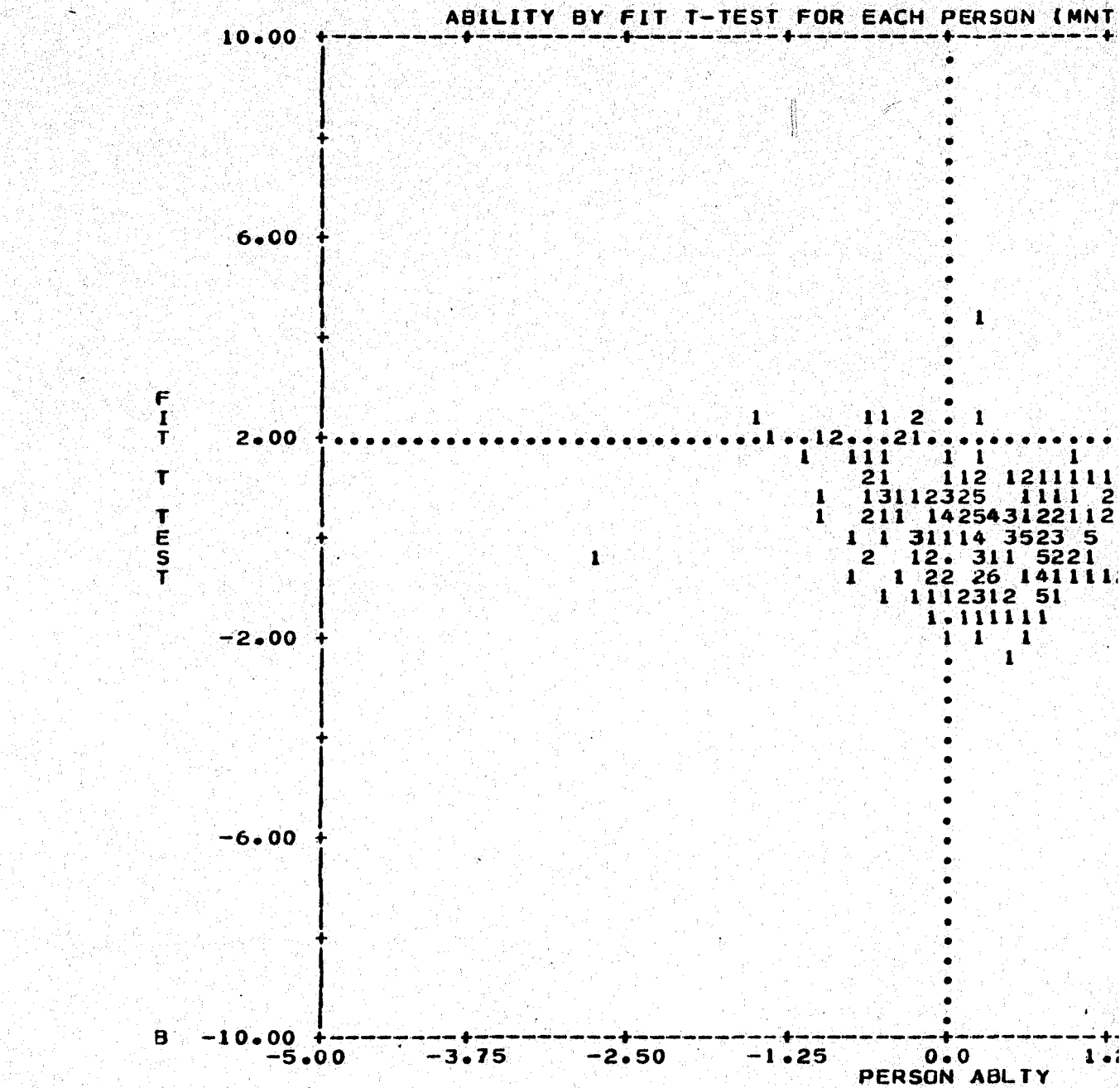
Based on the above information, there were seven examinees omitted from recalibration. There were then 196 examinees and no items being deleted. In Table 5 is a test characteristic curve, which is quite similar to Table 2. Again, the person separability index is .70.

TABLE 4. LIST OF PERSONS WITH FIT ABOVE 2.00

SEQ NUM	PERSON NAME [1]	WTD MNSQ	MNSQ SD	TOTAL FIT T	PERSON ABILITY	ERROR	RESPO
1	55141521	1.49	0.22	2.02	-1.53	0.40	0 1 0 0 -1 1 0 0
2	60251511	1.31	0.12	2.33	0.24	0.33	1 0 0 1 0-1-1 0-
3	59292421	1.32	0.14	2.05	-0.51	0.34	1 0 1 1 0-1 0 0
4	44081621	1.32	0.13	2.22	-0.29	0.33	1 1 0 1 0 0-1 0
5	44061421	1.60	0.12	4.16	0.14	0.33	1 1 1 0 0 0 0-1-
6	20811611	1.31	0.13	2.16	-0.29	0.33	0 0 0 1 -2-1-1 0
7	20522421	1.37	0.15	2.25	-0.62	0.34	1 0 1 0 0-1 0-1

[1]THESE 7 PERSONS WILL BE OMITTED FROM RECALIBRATION

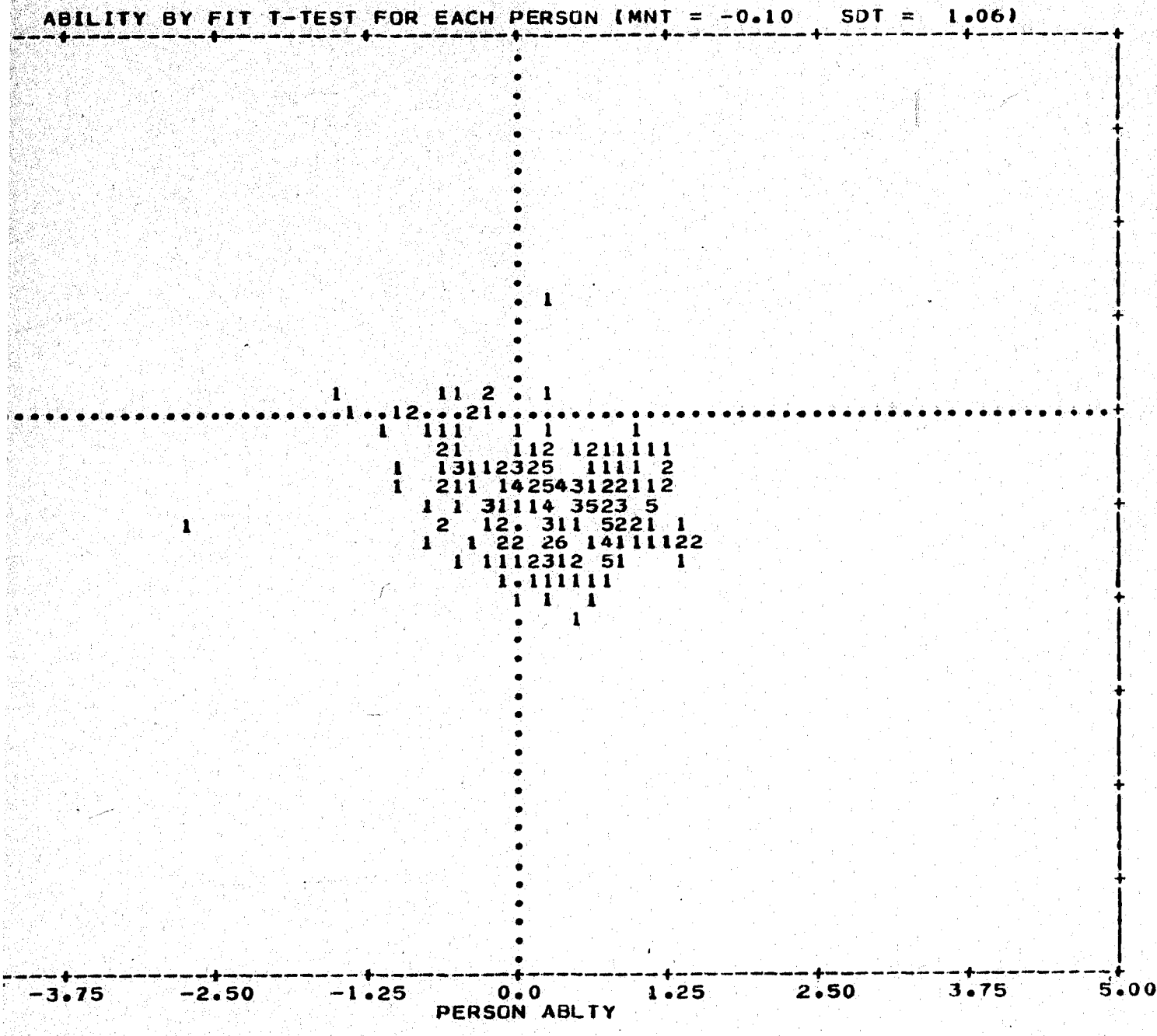
RSON Y ERROR	RESPONSES AND STANDARDIZED RESIDUALS (1ST 10 AND LAST 20 ITEMS)	
0.40	0 1 0 0 0 0 1 0 0 0	0 0 1 1 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 0
	-1 1 0 0 0-1 1 0 0 0	0 0 3 2 0 0 0-1 0 0 0 0 2 0 0 0 0 3-1 0
0.33	1 0 0 1 0 0 0 1 1 1	1 0 0 0 1 1 1 1 0 1 1 1 1 1 1 1 0 0 1 0
	0-1-1 0-1-3-2 1 0 1	1-1 0-1 0 0 1 0 0 1 0 0 1 0 1 0 0 0 0 0
0.34	1 0 1 1 0 1 0 0 1 1	1 0 0 0 0 0 1 1 1 0 0 0 0 0 0 0 0 1 0 0
	0-1 0 0 0 0-1 0 1 1	1-1 0 0 0 0 1 0 1 0 0-1 0 0 0-1 0 2-1 0
0.33	1 1 0 1 1 1 0 0 1 1	0 0 0 0 1 0 1 0 1 0 0 1 0 0 0 0 0 0 1 1
	0 0-1 0 1 0-1 0 0 1	0-1 0 0 0 0 1-2 1 0-1 0 0 0 0-1 0 0 0 2
0.33	1 1 1 0 0 1 0 0 1 1	1 0 1 0 1 0 0 1 1 0 0 0 0 1 1 0 0 1 0 1
	0 0 0-1-1 0-2 0 0 1	1-1 1-1 0-1 0 0 1 0-1-1 0 0 1-2 0 1-2 1
0.33	0 0 0 1 0 1 1 0 0 1	0 0 1 1 1 1 0 1 1 0 1 1 0 1 1 0 0 1 0 0
	-2-1-1 0 0 0 0 0-1 1	0-1 1 1 0 1 0 0 1 0 0 0 0 1 2-1 0 2-2 0
0.34	1 0 1 0 0 1 0 0 0 1	0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 1 0 0
	0-1 0-1 0 0-1 0 0 1	0 0 2 0 0 0 0 0 0 0 0 0 0 0 0-1 0 2-1 0



THE 7 PERSONS WITH FIT ABOVE 2.00 WILL BE OMITTED FROM RECALIBRAT

46 ITEMS CALIBRATED ON 203 PERSONS

GRAPH 1. ABILITY BY FIT FOR EACH PERSON



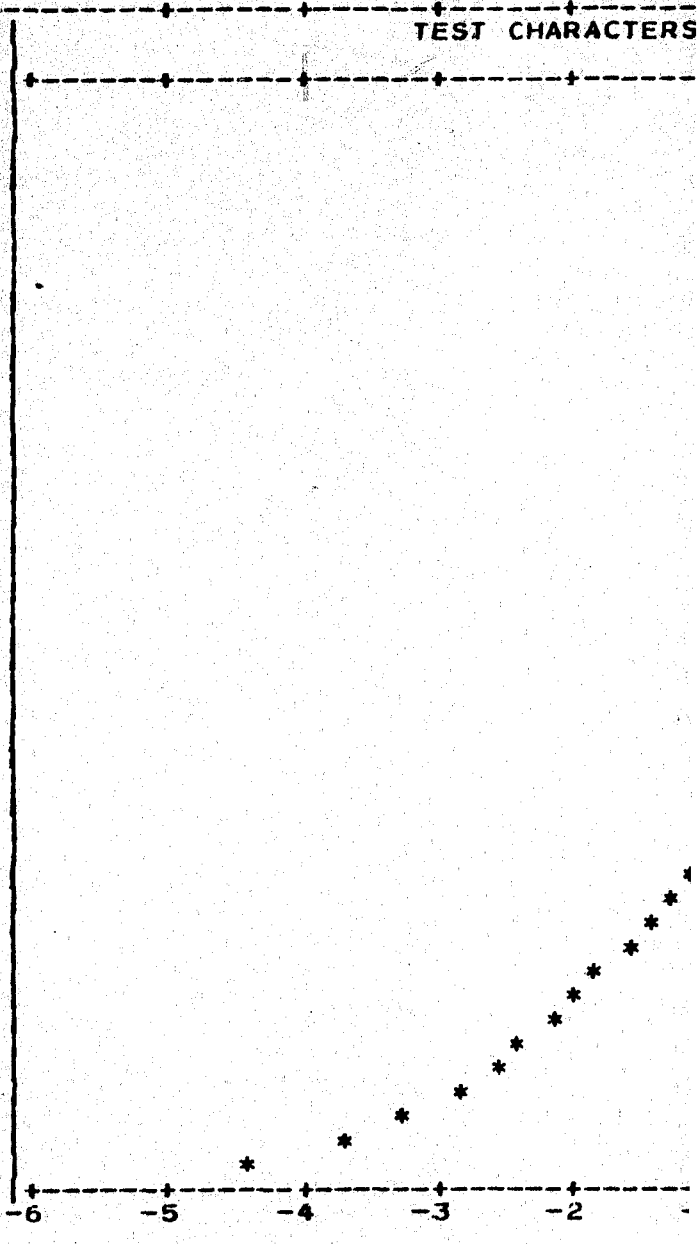
T ABOVE 2.00 WILL BE OMITTED FROM RECALIBRATION

ON 203 PERSONS

EACH PERSON

TABLE 5. COMPLETE SCORE EQUIVALENCE

RAW SCORE	COUNT	LOG ABILITY	STANDARD ERRORS
45	0	4.23	1.03
44	0	3.50	0.74
43	0	3.06	0.62
42	0	2.73	0.55
41	0	2.47	0.50
40	0	2.24	0.46
39	0	2.05	0.44
38	0	1.87	0.42
37	0	1.71	0.40
36	0	1.56	0.39
35	2	1.42	0.38
34	4	1.28	0.37
33	6	1.16	0.36
32	9	1.03	0.35
31	7	0.91	0.35
30	11	0.80	0.34
29	21	0.69	0.34
28	12	0.57	0.34
27	12	0.47	0.33
26	13	0.36	0.33
25	17	0.25	0.33
24	10	0.14	0.33
23	9	0.04	0.33
22	14	-0.07	0.33
21	10	-0.18	0.33
20	7	-0.29	0.34
19	5	-0.40	0.34
18	8	-0.51	0.34
17	6	-0.63	0.35
16	2	-0.75	0.35
15	3	-0.87	0.36
14	2	-0.99	0.36
13	3	-1.12	0.37
12	1	-1.26	0.38
11	1	-1.40	0.39
10	0	-1.55	0.40
9	0	-1.72	0.41
8	0	-1.89	0.43
7	0	-2.08	0.45
6	0	-2.29	0.48
5	0	-2.53	0.51
4	1	-2.81	0.56
3	0	-3.15	0.63
2	0	-3.61	0.76
1	0	-4.35	1.04

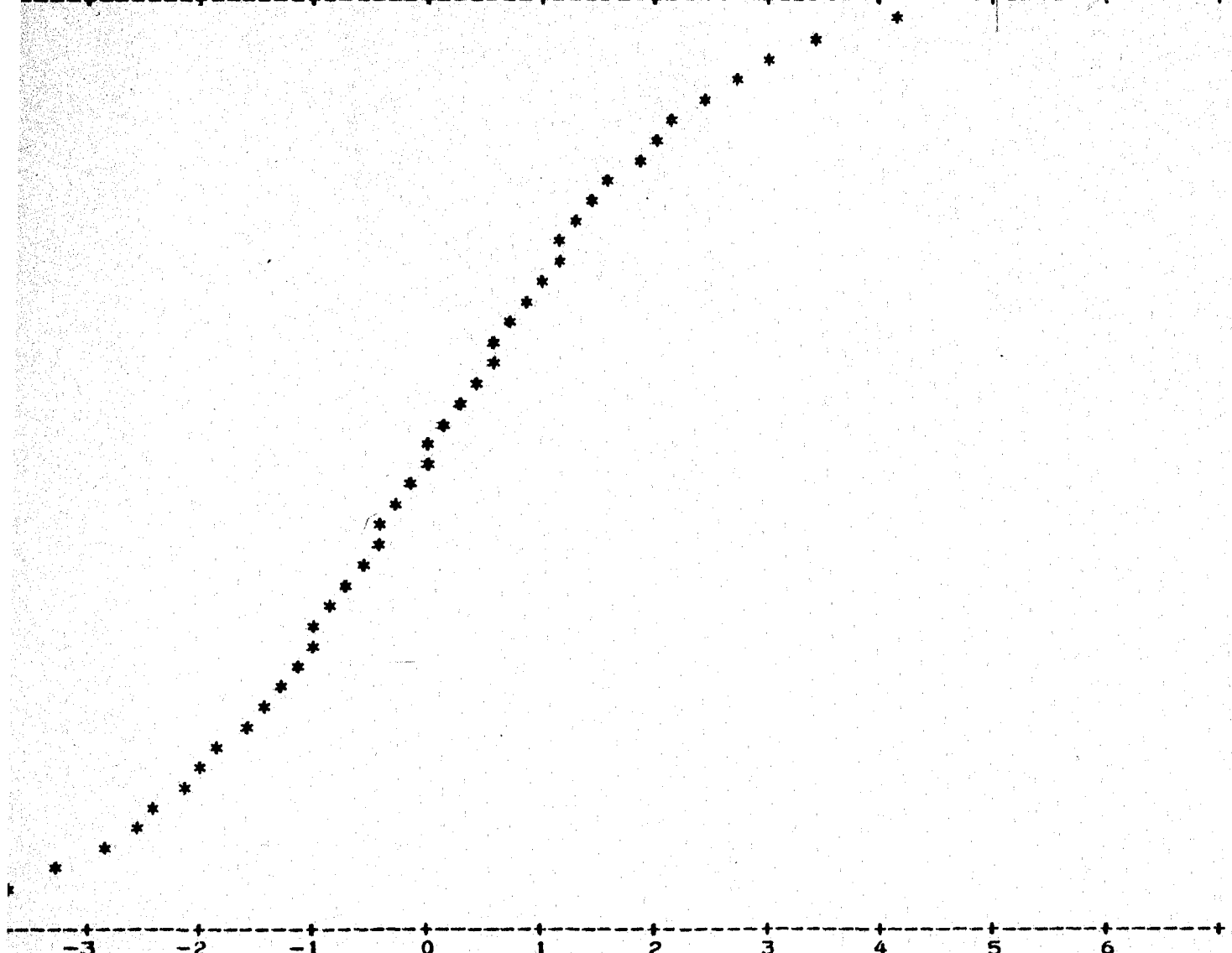


PERSON SEPARABILITY INDEX 0.70 (EQUIVALENT TO KR20)

46 ITEMS CALIBRATED ON 196 PERSONS
196 MEASURABLE PERSONS WITH MEAN ABILITY = 0.24 AND STD. DEV.

RECAL. WITH 7 MISFITTING PERSONS OMITTED

TEST CHARACTERSTC CURVE



20)

.24 AND STD. DEV. = 0.52

However, an inspection of the map of items and persons showed that two examinees scored between 2 SD and 3 SD (Table 6). It is evident that item 25 is still the most difficult item, however, items 26 and 43 have difficulties of 1.50, which is where the two examinees with the highest scores are located.

Items 18, 7, 42, 34, 45, 1, and 6 are the easiest items, with item 6 being the least difficult item of all 46. With seven examinees deleted from recalibration, only one examinee scored -5 SD from the mean. The map showed how items and persons were arranged about the mean.

BICAL omits persons from recalibration only one time, but a second list of examinees with total t values of above 2.0 is provided. Three persons had total t values of 2.0 or above (Table 7).

The item characteristic curve (ICC) panel depicted the distribution of the examinees with poorest examinees in the first group and the best examinees in the sixth group (Table 8). It is expected that the proportion of correct responses should increase from the first group to the sixth group. Most of the abnormal shifts occurred from the fourth to the sixth group. Inspection of the lower portion of the table showed that the mean ability did shift from the first to sixth group.

Displayed in the middle panel of Table 8 are the proportional departures of the expected ICC from that of the departures from observed ICC (first panel). For example, for item 14, too many of group 6 got the item incorrect and too many of group 1 got the item

TABLE 6. MAP OF VARIABLE

PERSON STATS	COUNT	RAW SCORE	MEASURE MIDPOINT(S.E.)	ITEM COUNTS	TYPICAL ITEMS		(BY N
		41	2.50(0.50)	1	IT25		
+4SD		40	2.30(0.46)				
		39	2.10(0.44)				
+3SD		38	1.90(0.42)				
		37	1.70(0.40)				
	2	35	1.50(0.38)	2	IT36	IT43	
+2SD	4	34	1.30(0.37)	5	IT16	IT17	IT41
	15	32	1.10(0.35)	1	IT29		
	7	31	0.90(0.35)	3	IT11	IT20	IT26
+1SD	32	29	0.70(0.34)	3	IT15	IT19	IT39
	24	27	0.50(0.33)	5	IT08	IT10	IT27
MEAN	30	25	0.30(0.33)	2	IT12	IT14	
	19	23	0.10(0.33)	1	IT05		
	24	21	-0.10(0.33)	4	IT21	IT22	IT30
-1SD	7	20	-0.30(0.34)	5	IT13	IT23	IT24
	13	18	-0.50(0.34)	2	IT09	IT31	
-2SD	8	16	-0.70(0.35)	3	IT03	IT04	IT38
	5	14	-0.90(0.36)	1	IT02		
	3	13	-1.10(0.37)	1	IT28		
-3SD	1	12	-1.30(0.38)				
	1	10	-1.50(0.40)	1	IT18		
		9	-1.70(0.41)	2	IT07	IT42	
-4SD		8	-1.90(0.43)				
		7	-2.10(0.45)	2	IT34	IT45	
-5SD		6	-2.30(0.48)	1	IT01		
		5	-2.50(0.51)				
			-2.70(0.51)	1	IT06		
	1	4	-2.90(0.56)				

46 ITEMS CALIBRATED ON 196 PERSONS
196 MEASURABLE PERSONS WITH MEAN ABILITY = 0.24 AND STD. DEV.

RECAL. WITH 7 MISFITTING PERSONS OMITTED

YPICAL ITEMS (BY NAME)

25

36 IT43
16 IT17 IT41 IT44 IT46
29
11 IT20 IT26
15 IT19 IT39
08 IT10 IT27 IT33 IT35
12 IT14
05
21 IT22 IT30 IT40
13 IT23 IT24 IT32 IT37
09 IT31
03 IT04 IT38
02
28

18
07 IT42

34 IT45
01

06

0.24 AND STD. DEV. = 0.52

TABLE 7. LIST OF PERSONS WITH FIT ABOVE 2.00

SEQ. NUM	PERSON NAME	WTD MNSQ	MNSQ SD	TOTAL FIT T	PERSON ABILITY	PERSON ERROR	RESP
1	62151411	1.41	0.18	2.12	-0.99	0.36	1 0 0 (0 0 0 (
2	19191621	1.41	0.18	2.10	-0.99	0.36	1 1 0 (0 1 0 (
3	59241611	1.31	0.14	2.08	-0.29	0.34	1 0 0 1 0-1-1 (

IN RROR	RESPONSES AND STANDARDIZED RESIDUALS (1ST 10 AND LAST 20 ITEMS)	
0.36	1 0 0 0 0 0 0 0 0 0	1 1 1 0 0 1 0 1 0 1 1 0 0 0 1 0 0 1 0 0
	0 0 0 0 0-2-1 0 0 0	2 0 2 0 0 1 0 0 0 3 1 0 0 0 3-1 0 3-1 0
0.36	1 1 0 0 0 0 1 1 1 1	1 0 0 0 0 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0
	0 1 0 0 0-2 0 2 1 2	2-1 0 0 0 1 0 0 0 3 0 0 0 0 0-1 0 0-1 0
0.34	1 0 0 1 1 0 0 0 0 1	0 1 1 0 1 0 0 1 1 0 0 1 1 1 1 1 0 0 1 0
	0-1-1 0 1-3-1 0-1 1	0 0 1 0 0 0 0 0 1 0-1 0 1 1 2 0 0 0 0 0

TABLE 8. ITEM FIT

SEQ NUM	ITEM NAME	ITEM CHARACTERISTIC CURVE 1ST GROUP	2ND GROUP	3RD GROUP	4TH GROUP	5TH GROUP	6TH GROUP	DEPARTURE FROM 1ST GROUP	2ND GROUP	3RD GROUP
1	IT01	0.75	0.94	0.97	0.92	0.97	0.96	-0.06	0.04	0.05
2	IT02	0.59	0.65	0.67	0.89	0.84	0.86	0.06	-0.04	-0.08
3	IT03	0.53	0.61	0.64	0.81	0.84	0.93	0.03	-0.04	-0.08
4	IT04	0.41	0.68	0.67	0.76	0.88	0.93	-0.08	0.04	-0.04
5	IT05	0.44	0.45	0.56	0.51	0.75	0.64	0.12	-0.01	0.02
6	IT06	0.81	0.94	0.92	0.97	1.00	1.00	-0.04	0.01	-0.02
7	IT07	0.69	0.84	0.89	0.92	0.91	0.86	-0.00	0.03	0.04
8	IT08	0.22	0.29	0.39	0.59	0.47	0.64	-0.00	-0.04	-0.02
9	IT09	0.47	0.65	0.75	0.54	0.75	0.86	0.04	0.07	0.10
10	IT10	0.22	0.23	0.42	0.54	0.53	0.71	-0.01	-0.11	0.00
11	IT11	0.13	0.19	0.25	0.32	0.53	0.64	-0.03	-0.05	-0.06
12	IT12	0.34	0.39	0.47	0.43	0.66	0.71	0.08	-0.01	0.00
13	IT13	0.53	0.42	0.69	0.68	0.78	0.79	0.12	-0.14	0.06
14	IT14	0.47	0.42	0.53	0.43	0.53	0.50	0.21	0.04	0.07
15	IT15	0.28	0.23	0.44	0.41	0.50	0.64	0.08	-0.09	0.06
16	IT16	0.16	0.10	0.19	0.27	0.25	0.61	0.05	-0.08	-0.03
17	IT17	0.09	0.13	0.33	0.35	0.44	0.21	-0.02	-0.06	0.10
18	IT18	0.56	0.77	0.86	0.97	0.97	0.93	-0.12	-0.03	0.01
19	IT19	0.31	0.26	0.47	0.41	0.44	0.64	0.10	-0.06	0.08
20	IT20	0.25	0.39	0.39	0.32	0.34	0.54	0.08	0.12	0.05
21	IT21	0.34	0.55	0.53	0.62	0.75	0.82	-0.02	0.05	-0.05
22	IT22	0.31	0.39	0.44	0.68	0.78	0.89	-0.03	-0.09	-0.11
23	IT23	0.38	0.55	0.61	0.59	0.81	0.79	-0.01	0.02	0.01
24	IT24	0.31	0.52	0.69	0.76	0.69	0.86	-0.09	-0.03	0.07
25	IT25	0.13	0.03	0.11	0.05	0.09	0.25	0.08	-0.04	0.02
26	IT26	0.16	0.32	0.25	0.32	0.53	0.68	-0.02	0.05	-0.09
27	IT27	0.34	0.42	0.39	0.38	0.50	0.57	0.13	0.09	-0.01
28	IT28	0.44	0.81	0.83	0.84	0.78	0.93	-0.13	0.10	0.07
29	IT29	0.22	0.35	0.14	0.35	0.38	0.46	0.08	0.13	-0.14
30	IT30	0.31	0.35	0.61	0.65	0.78	0.64	-0.01	-0.11	0.07
31	IT31	0.38	0.61	0.58	0.81	0.66	0.89	-0.04	0.05	-0.06
32	IT32	0.38	0.55	0.58	0.86	0.72	0.61	-0.01	0.02	-0.03
33	IT33	0.19	0.13	0.33	0.49	0.75	0.75	-0.03	-0.20	-0.07
34	IT34	0.72	0.87	0.92	0.97	0.97	1.00	-0.07	-0.01	0.01
35	IT35	0.22	0.35	0.42	0.46	0.59	0.64	-0.01	0.01	-0.00
36	IT36	0.19	0.16	0.17	0.19	0.34	0.50	0.08	-0.01	-0.06
37	IT37	0.28	0.48	0.67	0.84	0.69	0.89	-0.13	-0.07	0.04
38	IT38	0.25	0.65	0.67	0.84	0.81	0.96	-0.22	0.03	-0.02
39	IT39	0.19	0.42	0.33	0.35	0.56	0.71	-0.02	0.10	-0.06
40	IT40	0.22	0.45	0.50	0.68	0.84	0.75	-0.12	-0.02	-0.05
41	IT41	0.16	0.23	0.36	0.35	0.28	0.25	0.04	0.03	0.11
42	IT42	0.47	0.94	0.94	0.95	0.97	0.93	-0.25	0.11	0.07
43	IT43	0.16	0.16	0.08	0.30	0.28	0.36	0.07	0.01	-0.11
44	IT44	0.19	0.32	0.28	0.24	0.16	0.46	0.07	0.13	0.03
45	IT45	0.69	0.87	0.92	0.97	1.00	0.93	-0.09	0.00	0.02
46	IT46	0.16	0.19	0.36	0.38	0.25	0.32	0.03	-0.00	0.11
SCORE RANGE		1-19	20-22	23-25	26-28	29-30	31-45			
MEAN ABILITY		-0.77	-0.16	0.17	0.46	0.72	1.09			
MEAN Z-TEST		0.0	0.0	0.0	0.1	0.1	0.1			
SD(Z-TEST)		1.2	0.9	0.9	1.1	1.0	1.1			
GROUP COUNT		32	31	36	37	32	28			

PLUS=TOO MA
MINUS=TOO M

RECAL. WITH 7 MISFITTING PERSONS OMITTED

EPARTURE FROM EXPECTED ICC					ITEM FIT STATISTICS						
P 2ND GROUP	3RD GROUP	4TH GROUP	5TH GROUP	6TH GROUP	* ERR IMPAC	FIT T-TESTS BETWN	TOTAL	WTD MNSQ	MNSQ SD	DISC INDX	POINT BISER
6 0.04	0.05	-0.02	0.02	-0.00	0.0	-0.45	-0.18	0.95	0.21	1.22	0.24
6 -0.04	-0.08	0.09	0.01	-0.02	0.01	-0.13	0.32	1.03	0.09	0.93	0.22
3 -0.04	-0.08	0.04	0.03	0.06	0.01	-0.61	0.18	1.01	0.08	1.15	0.26
8 0.04	-0.04	-0.01	0.07	0.07	0.0	-0.32	-0.81	0.94	0.07	1.38	0.36
2 -0.01	0.02	-0.10	0.08	-0.10	0.03	0.51	1.48	1.06	0.04	0.59	0.18
4 0.01	-0.02	0.02	0.03	0.02	0.0	-0.51	-0.23	0.92	0.25	1.49	0.29
0 0.03	0.04	0.03	-0.00	-0.08	0.0	-0.19	-0.18	0.97	0.14	0.79	0.21
0 -0.04	-0.02	0.11	-0.08	0.01	0.0	-0.53	-0.19	0.99	0.04	1.04	0.28
4 0.07	0.10	-0.18	-0.02	0.03	0.01	1.06	0.46	1.03	0.06	0.76	0.23
1 -0.11	0.00	0.05	-0.02	0.08	0.0	-0.56	-0.96	0.96	0.04	1.25	0.33
3 -0.05	-0.06	-0.05	0.09	0.11	0.0	-0.04	-1.34	0.93	0.06	1.44	0.37
8 -0.01	0.00	-0.11	0.05	0.02	0.01	-0.42	0.29	1.01	0.04	0.85	0.26
2 -0.14	0.06	-0.03	0.03	-0.03	0.02	0.30	0.56	1.03	0.06	0.80	0.23
1 0.04	0.07	-0.10	-0.06	-0.18	0.06	2.28	3.26	1.13	0.04	0.03	0.07
8 -0.09	0.06	-0.05	-0.02	0.03	0.0	-0.38	-0.21	0.99	0.04	0.88	0.28
5 -0.08	-0.03	-0.01	-0.09	0.18	0.0	0.83	-0.49	0.96	0.08	1.21	0.27
2 -0.06	0.10	0.06	0.08	-0.23	0.01	1.44	0.40	1.03	0.08	0.77	0.19
2 -0.03	0.01	0.09	0.06	-0.00	0.0	0.72	-0.75	0.90	0.13	1.60	0.37
0 -0.06	0.08	-0.06	-0.09	0.02	0.02	0.29	0.97	1.04	0.04	0.69	0.19
8 0.12	0.05	-0.08	-0.13	-0.03	0.04	0.80	1.43	1.07	0.05	0.43	0.14
2 0.05	-0.05	-0.03	0.04	0.04	0.0	-1.38	-0.31	0.98	0.05	1.11	0.30
3 -0.09	-0.11	0.05	0.09	0.13	0.0	0.86	-2.19	0.91	0.04	1.51	0.44
1 0.02	0.01	-0.08	0.09	-0.01	0.0	-0.88	-0.12	0.99	0.05	1.03	0.29
9 -0.03	0.07	0.07	-0.06	0.05	0.0	-0.25	-0.95	0.95	0.05	1.28	0.35
8 -0.04	0.02	-0.07	-0.06	0.05	0.0	1.31	-0.09	0.98	0.17	0.56	0.13
2 0.05	-0.09	-0.08	0.06	0.11	0.0	0.15	-0.40	0.98	0.05	1.24	0.28
3 0.09	-0.01	-0.10	-0.04	-0.06	0.04	0.59	2.14	1.09	0.04	0.41	0.12
3 0.10	0.07	0.02	-0.07	0.04	0.0	0.62	-0.47	0.95	0.09	1.22	0.31
8 0.13	-0.14	0.00	-0.03	-0.03	0.02	1.19	0.74	1.05	0.06	0.58	0.15
1 -0.11	0.07	0.03	0.11	-0.11	0.0	0.41	-0.49	0.98	0.04	1.07	0.31
4 0.05	-0.06	0.10	-0.10	0.07	0.0	0.48	-0.51	0.97	0.06	1.15	0.32
1 0.02	-0.03	0.19	-0.01	-0.19	0.01	1.88	0.41	1.02	0.05	0.79	0.23
3 -0.20	-0.07	0.01	0.20	0.12	0.0	2.13	-2.90	0.89	0.04	1.71	0.45
7 -0.01	0.01	0.04	0.02	0.04	0.0	-0.31	-0.72	0.86	0.19	1.59	0.37
1 0.01	-0.00	-0.03	0.04	-0.00	0.01	-2.55	0.33	1.01	0.04	1.03	0.25
8 -0.01	-0.06	-0.09	0.01	0.08	0.0	0.25	-0.06	0.99	0.08	0.90	0.21
3 -0.07	0.04	0.14	-0.06	0.08	0.0	1.10	-1.26	0.93	0.06	1.51	0.39
2 0.03	-0.02	0.09	0.02	0.12	0.0	1.67	-1.94	0.87	0.07	1.79	0.47
2 0.10	-0.06	-0.11	0.03	0.10	0.0	0.27	-0.13	0.99	0.04	1.11	0.27
2 -0.02	-0.05	0.05	0.16	-0.01	0.0	0.68	-1.50	0.94	0.04	1.49	0.38
4 0.03	0.11	0.04	-0.08	-0.20	0.04	1.27	1.21	1.09	0.07	0.32	0.08
5 0.11	0.07	0.05	0.05	-0.02	0.0	2.54	-0.94	0.86	0.15	1.83	0.41
7 0.01	-0.11	0.05	-0.01	-0.02	0.01	0.26	0.15	1.01	0.09	0.77	0.16
7 0.13	0.03	-0.06	-0.20	0.02	0.03	1.77	0.90	1.07	0.07	0.36	0.09
9 0.00	0.02	0.05	0.06	-0.03	0.0	0.33	-0.51	0.90	0.18	1.45	0.33
3 -0.00	0.11	0.07	-0.12	-0.14	0.04	0.90	1.04	1.07	0.07	0.48	0.11

*ERROR IMPACT = PROPORTION ERROR INCREASE DUE TO THIS MISFIT

PLUS=TOO MANY RIGHT
MINUS=TOO MANY WRONG

correct. This pattern is unexpected. The pattern is particularly noticeable in items 27, 41, and 46.

When the final panel (item fit statistics) is examined, it can be seen that items 14 and 27 have very high error impacts and large t test totals. The statistic is expected to be near 0.0 for the error impact and less than 2.0 for the t-test total. Items 20, 41, and 46 have error impacts greater than .03 but their t-test totals are less than 2.0. Based on these statistics, items 14 and 27 should be deleted from recalibration.

Summarized in the fit order panel (Table 9) is how well the items fit the model. From this table it is seen that items 14 and 27 fit least well. Inspection of t-test total showed a large increase from item 5 to item 27 and a larger increase from item 27 to item 14. The discrimination indices for items 14 and 27 showed that observed and expected ICC are flatter than expected. The discrimination indices are for item 27, .41, and for item 14, .03. Further, the discrimination indices mean that the two items are not differentiating among these examinees as well as the other items.

For Form A, the mean of the total t fit is -.10 and the SD is 1.09. For this test the mean is near 0 and the SD is very near 1.0. The between fit for this test has a mean of .42 and a SD of .98. The mean is relatively far from 0.0, but the SD is very near 1.0. Overall, the items in Form A fit the Rasch model.

TABLE 9. ITEM ORDER

SERIAL ORDER						DIFFICULTY ORDER				
SEQ NUM	ITEM NAME	ITEM DIFF	STD ERROR	DISC INDX	FIT TTEST	SEQ NUM	ITEM NAME	ITEM DIFF	DISC INDX	FI TTE
1	IT01	-2.30	0.27	1.22	-0.18	6	IT06	-2.62	1.49	-0.
2	IT02	-0.91	0.17	0.93	0.32	1	IT01	-2.30	1.22	-0.
3	IT03	-0.77	0.17	1.15	0.18	34	IT34	-2.16	1.59	-0.
4	IT04	-0.72	0.16	1.38	-0.81	45	IT45	-2.04	1.45	-0.
5	IT05	0.02	0.15	0.59	1.48	42	IT42	-1.73	1.83	-0.
6	IT06	-2.62	0.30	1.49	-0.23	7	IT07	-1.60	0.79	-0.
7	IT07	-1.60	0.21	0.79	-0.18	18	IT18	-1.56	1.60	-0.
8	IT08	0.54	0.15	1.04	-0.19	28	IT28	-1.03	1.22	-0.
9	IT09	-0.47	0.16	0.76	0.46	2	IT02	-0.91	0.93	0.
10	IT10	0.52	0.15	1.25	-0.96	3	IT03	-0.77	1.15	0.
11	IT11	0.97	0.16	1.44	-1.34	4	IT04	-0.72	1.38	-0.
12	IT12	0.28	0.15	0.85	0.29	38	IT38	-0.62	1.79	-1.
13	IT13	-0.39	0.16	0.80	0.56	9	IT09	-0.47	0.76	0.
14	IT14	0.34	0.15	0.03	3.26	31	IT31	-0.42	1.15	-0.
15	IT15	0.63	0.15	0.88	-0.21	13	IT13	-0.39	0.80	0.
16	IT16	1.39	0.17	1.21	-0.49	37	IT37	-0.37	1.51	-1.
17	IT17	1.33	0.17	0.77	0.40	24	IT24	-0.35	1.28	-0.
18	IT18	-1.56	0.20	1.60	-0.75	32	IT32	-0.28	0.79	0.
19	IT19	0.61	0.15	0.69	0.97	23	IT23	-0.25	1.03	-0.
20	IT20	0.83	0.15	0.43	1.43	21	IT21	-0.16	1.11	-0.
21	IT21	-0.16	0.15	1.11	-0.31	22	IT22	-0.07	1.51	-2.
22	IT22	-0.07	0.15	1.51	-2.19	40	IT40	-0.05	1.49	-1.
23	IT23	-0.25	0.15	1.03	-0.12	30	IT30	-0.01	1.07	-0.
24	IT24	-0.35	0.16	1.28	-0.95	5	IT05	0.02	0.59	1.
25	IT25	2.46	0.23	0.56	-0.09	12	IT12	0.28	0.85	0.
26	IT26	0.83	0.15	1.24	-0.40	14	IT14	0.34	0.03	3.
27	IT27	0.56	0.15	0.41	2.14	35	IT35	0.50	1.03	0.
28	IT28	-1.03	0.18	1.22	-0.47	10	IT10	0.52	1.25	-0.
29	IT29	1.10	0.16	0.58	0.74	33	IT33	0.54	1.71	-2.
30	IT30	-0.01	0.15	1.07	-0.49	8	IT08	0.54	1.04	-0.
31	IT31	-0.42	0.16	1.15	-0.51	27	IT27	0.56	0.41	2.
32	IT32	-0.28	0.15	0.79	0.41	39	IT39	0.61	1.11	-0.
33	IT33	0.54	0.15	1.71	-2.90	19	IT19	0.61	0.69	0.
34	IT34	-2.16	0.25	1.59	-0.72	15	IT15	0.63	0.88	-0.
35	IT35	0.50	0.15	1.03	0.33	20	IT20	0.83	0.43	1.
36	IT36	1.41	0.17	0.90	-0.06	26	IT26	0.83	1.24	-0.
37	IT37	-0.37	0.16	1.51	-1.26	11	IT11	0.97	1.44	-1.
38	IT38	-0.62	0.16	1.79	-1.94	29	IT29	1.10	0.58	0.
39	IT39	0.61	0.15	1.11	-0.13	46	IT46	1.25	0.48	1.
40	IT40	-0.05	0.15	1.49	-1.50	41	IT41	1.28	0.32	1.
41	IT41	1.28	0.16	0.32	1.21	44	IT44	1.30	0.36	0.
42	IT42	-1.73	0.22	1.83	-0.94	17	IT17	1.33	0.77	0.
43	IT43	1.59	0.18	0.77	0.15	16	IT16	1.39	1.21	-0.
44	IT44	1.30	0.17	0.36	0.90	36	IT36	1.41	0.90	-0.
45	IT45	-2.04	0.24	1.45	-0.51	43	IT43	1.59	0.77	0.
46	IT46	1.25	0.16	0.48	1.04	25	IT25	2.46	0.56	-0.
	MEAN	0.0		1.03	-0.10					
	S.D.	1.13		0.43	1.09					

46 ITEMS CALIBRATED ON 196 PERSONS
196 MEASURABLE PERSONS WITH MEAN ABILITY = 0.24 AND STD. DEV.

RECAL. WITH 7 MISFITTING PERSONS OMITTED

TY ORDER

FIT ORDER

DISC INDX	FIT TTEST	SEQ NUM	ITEM NAME	ITEM DIFF	ERR IMPAC	FIT BETWN	T-TESTS TOTAL	WTD MNSQ	MNSQ SD	DISC INDX	POINT BISER
1.49	-0.23	33	IT33	0.54	0.0	2.13	-2.90	0.89	0.04	1.71	0.45
1.22	-0.18	22	IT22	-0.07	0.0	0.86	-2.19	0.91	0.04	1.51	0.44
1.59	-0.72	38	IT38	-0.62	0.0	1.67	-1.94	0.87	0.07	1.79	0.47
1.45	-0.51	40	IT40	-0.05	0.0	0.68	-1.50	0.94	0.04	1.49	0.38
1.83	-0.94	11	IT11	0.97	0.0	-0.04	-1.34	0.93	0.06	1.44	0.37
0.79	-0.18	37	IT37	-0.37	0.0	1.10	-1.26	0.93	0.06	1.51	0.39
1.60	-0.75	10	IT10	0.52	0.0	-0.56	-0.96	0.96	0.04	1.25	0.33
1.22	-0.47	24	IT24	-0.35	0.0	-0.25	-0.95	0.95	0.05	1.28	0.35
0.93	0.32	42	IT42	-1.73	0.0	2.54	-0.94	0.86	0.15	1.83	0.41
1.15	0.18	4	IT04	-0.72	0.0	-0.32	-0.81	0.94	0.07	1.38	0.36
1.38	-0.81	18	IT18	-1.56	0.0	0.72	-0.75	0.90	0.13	1.60	0.37
1.79	-1.94	34	IT34	-2.16	0.0	-0.31	-0.72	0.86	0.19	1.59	0.37
0.76	0.46	31	IT31	-0.42	0.0	0.48	-0.51	0.97	0.06	1.15	0.32
1.15	-0.51	45	IT45	-2.04	0.0	0.33	-0.51	0.90	0.18	1.45	0.33
0.80	0.56	30	IT30	-0.01	0.0	0.41	-0.49	0.98	0.04	1.07	0.31
1.51	-1.26	16	IT16	1.39	0.0	0.83	-0.49	0.96	0.08	1.21	0.27
1.28	-0.95	28	IT28	-1.03	0.0	0.62	-0.47	0.95	0.09	1.22	0.31
0.79	0.41	26	IT26	0.83	0.0	0.15	-0.40	0.98	0.05	1.24	0.28
1.03	-0.12	21	IT21	-0.16	0.0	-1.38	-0.31	0.98	0.05	1.11	0.30
1.11	-0.31	6	IT06	-2.62	0.0	-0.51	-0.23	0.92	0.25	1.49	0.29
1.51	-2.19	15	IT15	0.63	0.0	-0.38	-0.21	0.99	0.04	0.88	0.28
1.49	-1.50	8	IT08	0.54	0.0	-0.53	-0.19	0.99	0.04	1.04	0.28
1.07	-0.49	7	IT07	-1.60	0.0	-0.19	-0.18	0.97	0.14	0.79	0.21
0.59	1.48	1	IT01	-2.30	0.0	-0.45	-0.18	0.95	0.21	1.22	0.24
0.85	0.29	39	IT39	0.61	0.0	0.27	-0.13	0.99	0.04	1.11	0.27
0.03	3.26	23	IT23	-0.25	0.0	-0.88	-0.12	0.99	0.05	1.03	0.29
1.03	0.33	25	IT25	2.46	0.0	1.31	-0.09	0.98	0.17	0.56	0.13
1.25	-0.96	36	IT36	1.41	0.0	0.25	-0.06	0.99	0.08	0.90	0.21
1.71	-2.90	43	IT43	1.59	0.01	0.26	0.15	1.01	0.09	0.77	0.16
1.04	-0.19	3	IT03	-0.77	0.01	-0.61	0.18	1.01	0.08	1.15	0.26
0.41	2.14	12	IT12	0.28	0.01	-0.42	0.29	1.01	0.04	0.85	0.26
1.11	-0.13	2	IT02	-0.91	0.01	-0.13	0.32	1.03	0.09	0.93	0.22
0.69	0.97	35	IT35	0.50	0.01	-2.55	0.33	1.01	0.04	1.03	0.25
0.88	-0.21	17	IT17	1.33	0.01	1.44	0.40	1.03	0.08	0.77	0.19
0.43	1.43	32	IT32	-0.28	0.01	1.88	0.41	1.02	0.05	0.79	0.23
1.24	-0.40	9	IT09	-0.47	0.01	1.06	0.46	1.03	0.06	0.76	0.23
1.44	-1.34	13	IT13	-0.39	0.02	0.30	0.56	1.03	0.06	0.80	0.23
0.58	0.74	29	IT29	1.10	0.02	1.19	0.74	1.05	0.06	0.58	0.15
0.48	1.04	44	IT44	1.30	0.03	1.77	0.90	1.07	0.07	0.36	0.09
0.32	1.21	19	IT19	0.61	0.02	0.29	0.97	1.04	0.04	0.69	0.19
0.36	0.90	46	IT46	1.25	0.04	0.90	1.04	1.07	0.07	0.48	0.11
0.77	0.40	41	IT41	1.28	0.04	1.27	1.21	1.09	0.07	0.32	0.08
1.21	-0.49	20	IT20	0.83	0.04	0.80	1.43	1.07	0.05	0.43	0.14
0.90	-0.06	5	IT05	0.02	0.03	0.51	1.48	1.06	0.04	0.59	0.18
0.77	0.15	27	IT27	0.56	0.04	0.59	2.14	1.09	0.04	0.41	0.12
0.56	-0.09	14	IT14	0.34	0.06	2.28	3.26	1.13	0.04	0.03	0.07
						0.42	-0.10	0.98	0.08		
						0.98	1.09	0.06	0.05		

) STD. DEV. = 0.52

Items 14 and 27 were deleted because their departure from expected ICC showed that the poorest group was responding correctly on the items when the group should have been responding incorrectly to the items. Also, the error impacts were above .03, the t-test totals were above 2.0, and the discrimination indices were low. The results from the first analysis suggested that these items be omitted from further consideration. Therefore, a second analysis was made this time deleting items 14 and 27.

For the second analysis, 46 items were named in the program but 44 were selected. The 44 items reflected the omission of items 14 and 27. There were no examinees with scores below 1 nor above 45.

There were six persons omitted from recalibration with 197 examinees remaining. Their t-test totals ranged from 2.20 to 3.99. With deletion of the two items, now person 44061421 has a total t fit of 3.99 (Table 10) in comparison to 4.16 (Table 4).

Data in Table 11 showed that for 197 examinnes item 25 was still the most difficult and item 6 the easiest. In comparing the maps in Tables 6 and 11, there was a shift in some of the items. For example, item 43 (Table 11) was above the ability estimate of the examinees scoring highest on the test. Further inspection showed other items had shifted position as compared to their location in Table 4.

The Item Characteristic Curve showed that the change in the proportion answering correctly was most from group 4 to group 6 (Table 12). In looking at the item fit statistics panel, items 5, 19, 41, 44, and

TABLE 10. LIST OF PERSONS WITH FIT ABOVE 2.00

SEQ NUM	PERSON[1] NAME	WTD MNSQ	MNSQ SD	TOTAL FIT T	PERSON ABILITY	PERSON ERROR	RES
1	55141521	1.53	0.22	2.17	-1.47	0.40	0 1 0 -1 1 0
2	60251511	1.31	0.13	2.24	0.14	0.34	1 0 0 0-1-1
3	44081621	1.36	0.14	2.41	-0.19	0.34	1 1 0 0 0-1
4	44061421	1.61	0.13	3.99	0.03	0.34	1 1 1 0 0 0-
5	20811611	1.34	0.14	2.33	-0.19	0.34	0 0 0 -2-1-1
6	20522421	1.38	0.16	2.20	-0.66	0.35	1 0 1 0-1 0-

[1]THESE 6 PERSONS WILL BE OMITTED FROM RECALIBRATION

ON ERROR	RESPONSES AND STANDARDIZED RESIDUALS (1ST 10 AND LAST 20 ITEMS)	
0.40	0 1 0 0 0 0 1 0 0 0	0 0 1 1 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 0 0
	-1 1 0 0 0-1 1 0 0 0	0 0 3 2 0 0 0-1 0 0 0 0 2 0 0 0 0 3-1 0
0.34	1 0 0 1 0 0 0 1 1 1	0 0 0 0 1 1 1 1 0 1 1 1 1 1 1 1 0 0 1 0
	0-1-1 0-1-3-2 1 0 1	0-1 0-1 0 0 1 0 0 1 0 0 1 0 1 0 0 0 0 0
0.34	1 1 0 1 1 1 0 0 1 1	1 0 0 0 1 0 1 0 1 0 0 1 0 0 0 0 0 0 1 1
	0 0-1 0 1 0-1 0 0 1	1-1 0 0 0-1 1-2 1 0-1 0 0 0 0-2 0 0 0 2
0.34	1 1 1 0 0 1 0 0 1 1	1 0 1 0 1 0 0 1 1 0 0 0 0 1 1 0 0 1 0 1
	0 0 0-1 0 0-2 0 0 1	1-1 1-1 0-1 0 0 1 0-1-1 0 0 1-2 0 1-2 1
0.34	0 0 0 1 0 1 1 0 0 1	0 0 1 1 1 1 0 1 1 0 1 1 0 1 1 0 0 1 0 0
	-2-1-1 0 0 0 0 0-1 1	0-1 1 1 0 0 0 0 1 0 0 0 0 1 2-2 0 2-2 0
0.35	1 0 1 0 0 1 0 0 0 1	0 1 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 0 0
	0-1 0-1 0 0-1 0 0 1	0 0 2 0 0 0 0 0 0 0 0 0 0 0 0 0-1 0 2-1 0

TABLE 11. MAP OF VARIABLE

PERSON STATS	COUNT	RAW SCORE	MEASURE MIDPOINT(S.E.)	ITEM COUNTS	TYPICAL ITEMS (BY		
+4SD		39	2.50(0.50)	1	IT25		
		38	2.30(0.47)				
		37	2.10(0.44)				
+3SD		36	1.90(0.42)				
		35	1.70(0.40)	1	IT43		
	2	34	1.50(0.39)	2	IT16	IT36	
+2SD	9	32	1.30(0.37)	4	IT17	IT41	IT44
	10	31	1.10(0.36)	2	IT11	IT29	
+1SD	19	29	0.90(0.35)	2	IT20	IT26	
	33	27	0.70(0.35)	3	IT15	IT19	IT39
	11	26	0.50(0.34)	4	IT08	IT10	IT33
MEAN	30	24	0.30(0.34)	1	IT12		
	22	22	0.10(0.34)	2	IT05	IT30	
	23	20	-0.10(0.34)	3	IT21	IT22	IT40
-1SD	3	19	-0.30(0.34)	6	IT13	IT23	IT24
	17	17	-0.50(0.35)	2	IT09	IT38	
	7	15	-0.70(0.36)	2	IT03	IT04	
-2SD	3	14	-0.90(0.37)	1	IT02		
	6	12	-1.10(0.38)	1	IT28		
-3SD		11	-1.30(0.39)				
		10	-1.50(0.40)	2	IT07	IT18	
	1	9	-1.70(0.42)	1	IT42		
-4SD		8	-1.90(0.44)	1	IT45		
		7	-2.10(0.46)	1	IT34		
		6	-2.30(0.48)	1	IT01		
-5SD		5	-2.50(0.52)				
	1	4	-2.70(0.56)	1	IT06		
			-2.90(0.56)				

44 ITEMS CALIBRATED ON 197 PERSONS
197 MEASURABLE PERSONS WITH MEAN ABILITY = 0.26 AND STD. DEV

RECAL. WITH 6 MISFITTING PERSONS OMITTED

ITEMS (BY NAME)

T36
T41 IT44 IT46
T29
T26
T19 IT39
T10 IT33 IT35

T30
T22 IT40
T23 IT24 IT31 IT32 IT37
T38
T04

T18

ND STD. DEV. = 0.55

TABLE 12. ITEM FIT

SEQ NUM	ITEM NAME	ITEM CHARACTERISTIC CURVE 1ST GROUP	2ND GROUP	3RD GROUP	4TH GROUP	5TH GROUP	6TH GROUP	DEPARTURE FROM 1ST GROUP	2ND GROUP	3RD GROUP
1	IT01	0.77	0.95	0.96	0.92	0.97	0.97	-0.04	0.05	0.04
2	IT02	0.57	0.65	0.70	0.89	0.81	0.87	0.04	-0.04	-0.05
3	IT03	0.57	0.62	0.67	0.72	0.91	0.90	0.07	-0.04	-0.06
4	IT04	0.43	0.68	0.70	0.75	0.88	0.90	-0.06	0.03	-0.01
5	IT05	0.43	0.49	0.59	0.56	0.63	0.67	0.11	0.02	0.05
6	IT06	0.83	0.92	0.96	0.94	1.00	1.00	-0.03	-0.01	0.02
7	IT07	0.69	0.81	0.93	0.92	0.91	0.87	0.00	-0.00	0.07
8	IT08	0.20	0.32	0.37	0.61	0.53	0.57	-0.02	-0.01	-0.04
9	IT09	0.51	0.59	0.78	0.61	0.69	0.87	0.08	0.00	0.12
10	IT10	0.26	0.24	0.37	0.56	0.63	0.63	0.03	-0.11	-0.05
11	IT11	0.11	0.19	0.26	0.33	0.47	0.70	-0.04	-0.06	-0.05
12	IT12	0.34	0.43	0.52	0.50	0.53	0.70	0.08	0.03	0.04
13	IT13	0.54	0.43	0.74	0.67	0.81	0.77	0.13	-0.14	0.09
15	IT15	0.29	0.27	0.44	0.39	0.50	0.67	0.08	-0.05	0.05
16	IT16	0.14	0.14	0.19	0.22	0.31	0.57	0.04	-0.05	-0.05
17	IT17	0.09	0.24	0.30	0.19	0.53	0.27	-0.03	0.05	0.06
18	IT18	0.57	0.84	0.81	0.97	0.97	0.93	-0.11	0.03	-0.04
19	IT19	0.29	0.30	0.44	0.47	0.44	0.60	0.08	-0.03	0.05
20	IT20	0.23	0.38	0.44	0.36	0.31	0.50	0.06	0.10	0.10
21	IT21	0.34	0.49	0.52	0.67	0.75	0.83	-0.01	-0.02	-0.07
22	IT22	0.29	0.46	0.37	0.64	0.81	0.90	-0.05	-0.03	-0.19
23	IT23	0.43	0.51	0.59	0.67	0.78	0.77	0.05	-0.02	-0.02
24	IT24	0.31	0.57	0.67	0.75	0.72	0.83	-0.08	0.01	0.04
25	IT25	0.14	0.03	0.15	0.03	0.06	0.30	0.10	-0.05	0.05
26	IT26	0.20	0.30	0.26	0.36	0.44	0.70	0.03	0.02	-0.09
28	IT28	0.46	0.81	0.81	0.78	0.84	0.93	-0.10	0.10	0.04
29	IT29	0.20	0.35	0.15	0.22	0.47	0.47	0.06	0.12	-0.14
30	IT30	0.34	0.35	0.59	0.67	0.81	0.63	0.02	-0.12	0.05
31	IT31	0.37	0.59	0.59	0.78	0.69	0.90	-0.04	0.02	-0.05
32	IT32	0.34	0.57	0.59	0.83	0.75	0.63	-0.04	0.03	-0.02
33	IT33	0.23	0.11	0.37	0.47	0.72	0.80	0.01	-0.24	-0.05
34	IT34	0.74	0.86	0.96	0.97	0.94	1.00	-0.05	-0.02	0.05
35	IT35	0.23	0.38	0.41	0.44	0.63	0.63	0.00	0.02	-0.02
36	IT36	0.17	0.19	0.15	0.19	0.34	0.47	0.07	0.01	-0.08
37	IT37	0.29	0.51	0.74	0.83	0.66	0.87	-0.12	-0.05	0.11
38	IT38	0.26	0.65	0.63	0.86	0.84	0.93	-0.20	0.03	-0.06
39	IT39	0.17	0.41	0.33	0.44	0.44	0.73	-0.03	0.08	-0.06
40	IT40	0.23	0.49	0.52	0.67	0.78	0.77	-0.10	0.01	-0.04
41	IT41	0.14	0.24	0.41	0.28	0.34	0.27	0.03	0.05	0.16
42	IT42	0.49	0.92	0.93	0.97	0.97	0.93	-0.22	0.09	0.06
43	IT43	0.17	0.11	0.11	0.31	0.19	0.43	0.08	-0.04	-0.09
44	IT44	0.23	0.32	0.22	0.19	0.22	0.47	0.11	0.13	-0.03
45	IT45	0.63	0.89	0.96	1.00	0.97	0.93	-0.14	0.02	0.06
46	IT46	0.14	0.24	0.37	0.31	0.34	0.30	0.02	0.04	0.11
SCORE RANGE		1-18	19-22	23-24	25-27	28-29	30-43			
MEAN ABILITY		-0.77	-0.10	0.21	0.48	0.76	1.14			
MEAN Z-TEST		0.1	0.0	0.1	0.1	0.1	0.1			
SD(Z-TEST)		1.2	0.9	0.9	1.0	1.0	1.1			
GROUP COUNT		35	37	27	36	32	30			

PLUS=TOO MA
MINUS=TOO M

44 ITEMS CALIBRATED ON 197 PERSONS

RECAL. WITH 6 MISFITTING PERSONS OMITTED

ARTURE FROM EXPECTED ICC					ITEM FIT STATISTICS						
2ND GROUP	3RD GROUP	4TH GROUP	5TH GROUP	6TH GROUP	* ERR IMPAC	FIT T-TESTS BETWN	TOTAL	WTD MNSQ	MNSQ SD	DISC INDX	POINT BISER
0.05	0.04	-0.02	0.01	-0.00	0.0	-0.81	-0.16	0.95	0.21	1.12	0.23
-0.04	-0.05	0.09	-0.03	-0.02	0.01	-0.56	0.37	1.03	0.08	0.93	0.23
-0.04	-0.06	-0.05	0.08	0.03	0.01	-0.19	0.27	1.02	0.08	0.99	0.26
0.03	-0.01	-0.02	0.06	0.04	0.0	-1.10	-0.57	0.96	0.07	1.26	0.34
0.02	0.05	-0.05	-0.05	-0.08	0.04	-0.04	1.69	1.07	0.04	0.50	0.18
-0.01	0.02	-0.01	0.03	0.02	0.0	-0.85	-0.27	0.92	0.25	1.37	0.29
-0.00	0.07	0.03	-0.00	-0.07	0.0	-0.15	-0.20	0.97	0.13	0.83	0.22
-0.01	-0.04	0.13	-0.02	-0.07	0.0	-0.29	-0.00	1.00	0.04	0.98	0.28
0.00	0.12	-0.11	-0.08	0.04	0.02	0.59	0.66	1.04	0.06	0.70	0.22
-0.11	-0.05	0.07	0.07	-0.02	0.0	-0.27	-0.42	0.98	0.04	1.10	0.31
-0.06	-0.05	-0.04	0.03	0.17	0.0	0.26	-1.33	0.93	0.06	1.49	0.38
0.03	0.04	-0.05	-0.08	-0.00	0.02	-0.71	0.96	1.04	0.04	0.68	0.23
-0.14	0.09	-0.04	0.05	-0.05	0.02	0.99	0.79	1.05	0.06	0.75	0.22
-0.05	0.05	-0.07	-0.03	0.04	0.0	-0.41	-0.01	1.00	0.04	0.86	0.28
-0.05	-0.05	-0.06	-0.03	0.13	0.0	-0.03	-0.39	0.97	0.08	1.17	0.26
0.05	0.06	-0.10	0.18	-0.18	0.01	1.72	0.40	1.03	0.08	0.80	0.21
0.03	-0.04	0.09	0.06	-0.00	0.0	0.71	-0.71	0.90	0.13	1.50	0.37
-0.03	0.05	0.01	-0.09	-0.02	0.02	-0.53	1.11	1.05	0.04	0.69	0.20
0.10	0.10	-0.04	-0.16	-0.07	0.04	1.06	1.54	1.08	0.05	0.42	0.14
-0.02	-0.07	0.02	0.04	0.05	0.0	-1.43	-0.44	0.98	0.05	1.19	0.33
-0.03	-0.19	0.01	0.12	0.14	0.0	1.43	-2.24	0.90	0.05	1.51	0.44
-0.02	-0.02	-0.01	0.05	-0.03	0.00	-1.67	0.19	1.01	0.05	0.90	0.27
0.01	0.04	0.06	-0.03	0.02	0.0	-1.01	-1.00	0.95	0.06	1.22	0.37
-0.05	0.05	-0.10	-0.09	0.08	0.0	2.68	-0.08	0.98	0.17	0.55	0.12
0.02	-0.09	-0.05	-0.04	0.13	0.0	-0.25	-0.33	0.98	0.05	1.09	0.29
0.10	0.04	-0.04	-0.01	0.04	0.0	0.03	-0.53	0.95	0.09	1.22	0.32
0.12	-0.14	-0.12	0.06	-0.04	0.02	1.43	0.76	1.05	0.06	0.65	0.16
-0.12	0.05	0.05	0.14	-0.12	0.0	0.99	-0.48	0.98	0.04	1.01	0.32
0.02	-0.05	0.07	-0.07	0.08	0.0	-0.21	-0.50	0.97	0.06	1.18	0.33
0.03	-0.02	0.16	0.02	-0.17	0.01	1.41	0.31	1.02	0.05	0.88	0.26
-0.24	-0.05	-0.01	0.17	0.16	0.0	2.49	-2.57	0.90	0.04	1.64	0.44
-0.02	0.05	0.04	-0.01	0.04	0.0	-0.27	-0.69	0.86	0.19	1.42	0.36
0.02	-0.02	-0.05	0.06	-0.02	0.01	-1.72	0.45	1.02	0.04	0.98	0.26
0.01	-0.08	-0.08	0.01	0.04	0.00	-0.09	0.09	1.01	0.08	0.84	0.20
-0.05	0.11	0.14	-0.09	0.05	0.0	1.24	-1.20	0.93	0.06	1.37	0.39
0.03	-0.06	0.12	0.05	0.09	0.0	1.71	-2.00	0.87	0.07	1.75	0.48
0.08	-0.06	-0.02	-0.09	0.11	0.0	0.05	-0.18	0.99	0.04	1.10	0.28
0.01	-0.04	0.04	0.10	0.01	0.0	-0.32	-1.35	0.94	0.04	1.36	0.38
0.05	0.16	-0.03	-0.02	-0.19	0.04	1.22	1.24	1.09	0.07	0.41	0.10
0.09	0.06	0.08	0.05	-0.01	0.0	2.32	-1.06	0.85	0.14	1.80	0.43
-0.04	-0.09	0.06	-0.11	0.05	0.01	0.95	0.15	1.01	0.09	0.80	0.17
0.13	-0.03	-0.11	-0.15	0.01	0.04	2.02	1.06	1.08	0.07	0.31	0.09
0.02	0.06	0.08	0.03	-0.02	0.0	1.27	-0.61	0.89	0.17	1.59	0.35
0.04	0.11	-0.00	-0.03	-0.17	0.04	0.47	1.11	1.08	0.07	0.50	0.11

*ERROR IMPACT = PROPORTION ERROR INCREASE DUE TO THIS MISFIT

PLUS=TOO MANY RIGHT
MINUS=TOO MANY WRONG

46 had error impacts greater than .03, however, none of the items had total t fits of greater than 2.0. The discrimination indices for these items were far less than the desired. For the six items, the best group responded incorrectly to too many items to which they should have responded correctly.

Inspection of column five of the fit order panel (Table 13) showed that items 5, 19, and 46 have between fits of much less than 1.00. For the overall test, the fit between mean is .32 which is more than 0.0 and a SD of 1.11 which is a little above 1.00. The error impacts for five items were above .03 but the t-test totals did not sharply increase from item to item. For this analysis of Form A, the mean for t-test totals was -.14 and a SD of .95. The SD for t-test totals fit was nearer 1.0.

In comparing first analysis with the second analysis for t-test total fit and fit between, the t-test total mean increased from -.10 to -.14 and the t-test total SD decreased from 1.09 to .95. The between fit mean decreased from .42 to .32 and the between fit SD increased from .98 to 1.11. The second analysis suggested that after eliminating items 14 and 27 the remaining items better fit the Rasch model. Items with high error impact while fitting the Rasch model are subject to review even though they fit expectations of the t-test total statistic.

Results of Forms B, C, D, and E

A complete description of the procedures used to select items with the Rasch model was presented in the previous section in reporting the

TABLE 13. ITEM ORDER

SERIAL ORDER						DIFFICULTY ORDER				
SEQ NUM	ITEM NAME	ITEM DIFF	STD ERROR	DISC INDX	FIT TTEST	SEQ NUM	ITEM NAME	ITEM DIFF	DISC INDX	FIT TTEST
1	IT01	-2.30	0.27	1.12	-0.16	6	IT06	-2.62	1.37	-0.2
2	IT02	-0.88	0.17	0.93	0.37	1	IT01	-2.30	1.12	-0.1
3	IT03	-0.77	0.17	0.99	0.27	34	IT34	-2.17	1.42	-0.6
4	IT04	-0.72	0.17	1.26	-0.57	45	IT45	-1.99	1.59	-0.6
5	IT05	0.04	0.15	0.50	1.69	42	IT42	-1.69	1.80	-1.0
6	IT06	-2.62	0.30	1.37	-0.27	18	IT18	-1.56	1.50	-0.7
7	IT07	-1.56	0.20	0.83	-0.20	7	IT07	-1.56	0.83	-0.2
8	IT08	0.57	0.15	0.98	-0.00	28	IT28	-1.00	1.22	-0.5
9	IT09	-0.46	0.16	0.70	0.66	2	IT02	-0.88	0.93	0.3
10	IT10	0.53	0.15	1.10	-0.42	3	IT03	-0.77	0.99	0.2
11	IT11	1.01	0.16	1.49	-1.33	4	IT04	-0.72	1.26	-0.5
12	IT12	0.29	0.15	0.68	0.96	38	IT38	-0.59	1.75	-2.0
13	IT13	-0.39	0.16	0.75	0.79	9	IT09	-0.46	0.70	0.6
15	IT15	0.64	0.15	0.86	-0.01	13	IT13	-0.39	0.75	0.7
16	IT16	1.42	0.17	1.17	-0.39	31	IT31	-0.39	1.18	-0.5
17	IT17	1.36	0.17	0.80	0.40	37	IT37	-0.34	1.37	-1.2
18	IT18	-1.56	0.20	1.50	-0.71	24	IT24	-0.32	1.22	-1.0
19	IT19	0.64	0.15	0.69	1.11	32	IT32	-0.25	0.88	0.3
20	IT20	0.86	0.15	0.42	1.54	23	IT23	-0.25	0.90	0.1
21	IT21	-0.13	0.15	1.19	-0.44	21	IT21	-0.13	1.19	-0.4
22	IT22	-0.04	0.15	1.51	-2.24	22	IT22	-0.04	1.51	-2.2
23	IT23	-0.25	0.15	0.90	0.19	40	IT40	-0.02	1.36	-1.3
24	IT24	-0.32	0.16	1.22	-1.00	30	IT30	0.02	1.01	-0.4
25	IT25	2.44	0.23	0.55	-0.08	5	IT05	0.04	0.50	1.6
26	IT26	0.84	0.15	1.09	-0.33	12	IT12	0.29	0.68	0.9
28	IT28	-1.00	0.18	1.22	-0.53	35	IT35	0.50	0.98	0.4
29	IT29	1.13	0.16	0.65	0.76	10	IT10	0.53	1.10	-0.4
30	IT30	0.02	0.15	1.01	-0.48	33	IT33	0.55	1.64	-2.9
31	IT31	-0.39	0.16	1.18	-0.50	8	IT08	0.57	0.98	-0.(
32	IT32	-0.25	0.15	0.88	0.31	19	IT19	0.64	0.69	1.1
33	IT33	0.55	0.15	1.64	-2.57	15	IT15	0.64	0.86	-0.(
34	IT34	-2.17	0.25	1.42	-0.69	39	IT39	0.64	1.10	-0.
35	IT35	0.50	0.15	0.98	0.45	26	IT26	0.84	1.09	-0.
36	IT36	1.45	0.17	0.84	0.09	20	IT20	0.86	0.42	1.9
37	IT37	-0.34	0.16	1.37	-1.20	11	IT11	1.01	1.49	-1.
38	IT38	-0.59	0.16	1.75	-2.00	29	IT29	1.13	0.65	0.
39	IT39	0.64	0.15	1.10	-0.18	46	IT46	1.28	0.50	1.
40	IT40	-0.02	0.15	1.36	-1.35	41	IT41	1.31	0.41	1.
41	IT41	1.31	0.17	0.41	1.24	44	IT44	1.31	0.31	1.
42	IT42	-1.69	0.21	1.80	-1.06	17	IT17	1.36	0.80	0.
43	IT43	1.62	0.18	0.80	0.15	16	IT16	1.42	1.17	-0.
44	IT44	1.31	0.17	0.31	1.06	36	IT36	1.45	0.84	0.
45	IT45	-1.99	0.24	1.59	-0.61	43	IT43	1.62	0.80	0.
46	IT46	1.28	0.16	0.50	1.11	25	IT25	2.44	0.55	-0.
	MEAN	-0.00		1.03	-0.14					
	S.D.	1.15		0.38	0.95					

44 ITEMS CALIBRATED ON 197 PERSONS
197 MEASURABLE PERSONS WITH MEAN ABILITY = 0.26 AND STD. DEV.

RECAL. WITH 6 MISFITTING PERSONS OMITTED

Y ORDER

FIT ORDER

DISC INDX	FIT TTEST	SEQ NUM	ITEM NAME	ITEM DIFF	ERR IMPAC	FIT BETWN	T-TESTS TOTAL	WTD MNSQ	MNSQ SD	DISC INDX	POINT BISER
1.37	-0.27	33	IT33	0.55	0.0	2.49	-2.57	0.90	0.04	1.64	0.44
1.12	-0.16	22	IT22	-0.04	0.0	1.43	-2.24	0.90	0.05	1.51	0.44
1.42	-0.69	38	IT38	-0.59	0.0	1.71	-2.00	0.87	0.07	1.75	0.48
1.59	-0.61	40	IT40	-0.02	0.0	-0.32	-1.35	0.94	0.04	1.36	0.38
1.80	-1.06	11	IT11	1.01	0.0	0.26	-1.33	0.93	0.06	1.49	0.38
1.50	-0.71	37	IT37	-0.34	0.0	1.24	-1.20	0.93	0.06	1.37	0.39
0.83	-0.20	42	IT42	-1.69	0.0	2.32	-1.06	0.85	0.14	1.80	0.43
1.22	-0.53	24	IT24	-0.32	0.0	-1.01	-1.00	0.95	0.06	1.22	0.37
0.93	0.37	18	IT18	-1.56	0.0	0.71	-0.71	0.90	0.13	1.50	0.37
0.99	0.27	34	IT34	-2.17	0.0	-0.27	-0.69	0.86	0.19	1.42	0.36
1.26	-0.57	45	IT45	-1.99	0.0	1.27	-0.61	0.89	0.17	1.59	0.35
1.75	-2.00	4	IT04	-0.72	0.0	-1.10	-0.57	0.96	0.07	1.26	0.34
0.70	0.66	28	IT28	-1.00	0.0	0.03	-0.53	0.95	0.09	1.22	0.32
0.75	0.79	31	IT31	-0.39	0.0	-0.21	-0.50	0.97	0.06	1.18	0.33
1.18	-0.50	30	IT30	0.02	0.0	0.99	-0.48	0.98	0.04	1.01	0.32
1.37	-1.20	21	IT21	-0.13	0.0	-1.43	-0.44	0.98	0.05	1.19	0.33
1.22	-1.00	10	IT10	0.53	0.0	-0.27	-0.42	0.98	0.04	1.10	0.31
0.88	0.31	16	IT16	1.42	0.0	-0.03	-0.39	0.97	0.08	1.17	0.26
0.90	0.19	26	IT26	0.84	0.0	-0.25	-0.33	0.98	0.05	1.09	0.29
1.19	-0.44	6	IT06	-2.62	0.0	-0.85	-0.27	0.92	0.25	1.37	0.29
1.51	-2.24	7	IT07	-1.56	0.0	-0.15	-0.20	0.97	0.13	0.83	0.22
1.36	-1.35	39	IT39	0.64	0.0	0.05	-0.18	0.99	0.04	1.10	0.28
1.01	-0.48	1	IT01	-2.30	0.0	-0.81	-0.16	0.95	0.21	1.12	0.23
0.50	1.69	25	IT25	2.44	0.0	2.68	-0.08	0.98	0.17	0.55	0.12
0.68	0.96	15	IT15	0.64	0.0	-0.41	-0.01	1.00	0.04	0.86	0.28
0.98	0.45	8	IT08	0.57	0.0	-0.29	-0.00	1.00	0.04	0.98	0.28
1.10	-0.42	36	IT36	1.45	0.00	-0.09	0.09	1.01	0.08	0.84	0.20
1.64	-2.57	43	IT43	1.62	0.01	0.95	0.15	1.01	0.09	0.80	0.17
0.98	-0.00	23	IT23	-0.25	0.00	-1.67	0.19	1.01	0.05	0.90	0.27
0.69	1.11	3	IT03	-0.77	0.01	-0.19	0.27	1.02	0.08	0.99	0.26
0.86	-0.01	32	IT32	-0.25	0.01	1.41	0.31	1.02	0.05	0.88	0.26
1.10	-0.18	2	IT02	-0.88	0.01	-0.56	0.37	1.03	0.08	0.93	0.23
1.09	-0.33	17	IT17	1.36	0.01	1.72	0.40	1.03	0.08	0.80	0.21
0.42	1.54	35	IT35	0.50	0.01	-1.72	0.45	1.02	0.04	0.98	0.26
1.49	-1.33	9	IT09	-0.46	0.02	0.59	0.66	1.04	0.06	0.70	0.22
0.65	0.76	29	IT29	1.13	0.02	1.43	0.76	1.05	0.06	0.65	0.16
0.50	1.11	13	IT13	-0.39	0.02	0.99	0.79	1.05	0.06	0.75	0.22
0.41	1.24	12	IT12	0.29	0.02	-0.71	0.96	1.04	0.04	0.68	0.23
0.31	1.06	44	IT44	1.31	0.04	2.02	1.06	1.08	0.07	0.31	0.09
0.80	0.40	19	IT19	0.64	0.02	-0.53	1.11	1.05	0.04	0.69	0.20
1.17	-0.39	46	IT46	1.28	0.04	0.47	1.11	1.08	0.07	0.50	0.11
0.84	0.09	41	IT41	1.31	0.04	1.22	1.24	1.09	0.07	0.41	0.10
0.80	0.15	20	IT20	0.86	0.04	1.06	1.54	1.08	0.05	0.42	0.14
0.55	-0.08	5	IT05	0.04	0.04	-0.04	1.69	1.07	0.04	0.50	0.18
						0.32	-0.14	0.98	0.08		
						1.11	0.95	0.06	0.05		

ID STD. DEV. = 0.55

results for Form A. In this section which summarizes the four remaining forms of the test, the same procedures were followed by the researcher.

The procedures were the interpretation of the following: error impact, person separability index, total t fit (t-test total), between group t (fit between), discrimination index, the Item Characteristic Curve panel, the departure from expected Item Characteristic Curve panel, and a map showing the distribution of the items and the persons. However, a detailed explanation is not presented for Forms B, C, D, and E regarding the procedures rather a summary of the results based on interpreting the detailed procedures for each test form.

Form B Item 4, 7, and 14 were deleted for the recalibration of Form B (Table 14). The person separability index increased from .68 to .69 on the second analysis of the program. For both analyses, item 20 was the most difficult item. There were shifts in the distance various items ranged from the mean for the two analyses.

The deletion of the three items and the omission of 10 examinees reflected some change in the item characteristic curve panel, and departure from expected ICC panel. For the second analysis, the number of items with error impact greater than .03 decreased.

The mean of the t-test total increased from -.06 to -.10 and the SD for the t-test total decreased from .96 to .94. However, the mean remains near 0 and the SD near 1.0. For the between fit, the mean decreased from .47 to .35 and the SD decreased from 1.03 to .72. The statistics are farther from a mean of 0.0 and a SD of 1.0 than was expected.

Table 14. Summary of information for test Forms B through E

Form of Test	Before Calibration		After Calibration		
	Number of Examinees	Number of Items	Number of Examinees	Number of Items	Items Deleted
B	222	46	212	43	4, 7, 14
C	191	46	184	43	13, 18, 28
D	214	46	205	41	3, 4, 18, 31, 42
E	209	46	205	42	1, 6, 37, 39

Form C A person separability index of .77 was calculated for the two analyses of Form C. Three items and seven examinees were omitted from the second calibration (Table 14). Item 12 continued to be the most difficulty with one examinee having an ability estimate above the difficulty of this item.

The deletion of items 13, 18, and 28 on the second analysis left items 2, 36, 41, 42, 43, and 46 with error impacts greater than .03. The t-test totals for items 2, 36, 41, 42, 43, and 46 were out of line for what was expected in the order of fit.

There was a decrease in the mean of the t-test total from -.09 to -.08 and a decrease in the SD from 1.19 to 1.10. The two statistics are closer to the expected on the second analysis. The mean for the fit between decreased from .67 to .53 which put it slightly closer to a mean of 0.0 but the SD decreased from 1.05 to .91 putting it slightly farther from a SD of 1.0.

Form D There was an increase in the person separability index for the second analysis of Form D. This index increased from .73 to .76.

With the omission of nine examinees, Item 13 is the most difficult item. There was a shift in position of some of the remaining items from their position in the first analysis. Items 3, 4, 18, 31, and 42 were deleted from recalibration (Table 14), but several items still appeared not to fit the model.

The mean for t-test total increased from -.20 to -.24 but the SD decreased from 1.49 to 1.30. For fit between, the mean decreased from 1.11 to .83 and the SD increased from 1.06 to 1.26.

With some items still having high error impacts, the researcher inspected the items and it appeared that if rewritten they could be reanalyzed in a subsequent analysis to determine their fit to the model.

Form E Four items were omitted from the second analysis of Form E (Table 14). The person separability index increased from .68 to .71.

One examinee scored above the difficulty level of the most difficult item, 43. The remaining items fell in a pattern similar to the first analysis with exception of the omitted items. Four items remained less difficult than the person ability of the examinee with the lowest score.

With four items and four examinees omitted, there appeared to be few items which did not fit the model. There was a slight increase in the mean of t-test fit, from -.02 to -.08; however, the SD decreased from 1.17 to 1.02. The fit between reflected a decrease in mean and SD from the first analysis. The mean decreased from 1.21 to 1.05. This decrease in the statistics for the fit between moved both nearer the expected values.

Presentation of the Final Test

A comprehensive consumer and homemaking achievement test was administered in five forms to 1039 students. The 230 items were calibrated using the Rasch model.

From the analysis of the data, information was provided which gave a picture of the items and the persons. Though the final decision on items to retain was subjective, the Rasch model presented information for inspection in a different manner than is provided by traditional

item analysis. For instance, it was possible to see the items which were appropriate at different person ability levels.

The means and SD for t-test total and fit between for the five forms of the test fluctuated from the first analysis to the second analysis (Table 15). These statistics were interpreted against an expected mean of 0.0 and a SD of 1.0. In four cases, the t-test total mean was close to the expected mean of 0.0 with the respective SD being near 1.0. The mean and SD for the t-test total for Form D departed most from the expected values.

Table 15. Means and standard deviations for t-test total and fit between for each test form

	T-test total		Fit between	
	First analysis	Second analysis	First analysis	Second analysis
Form A	-.10[a]	-.14	.42	.32
	1.09[b]	1.11	.98	1.11
Form B	-.06	-.10	.47	.35
	.96	.94	1.03	.72
Form C	-.09	-.08	.67	.53
	1.19	1.10	1.05	.91
Form D	-.20	.24	1.11	.83
	1.49	1.30	1.06	1.26
Form E	-.02	-.08	.58	.33
	1.17	1.02	1.21	1.05

[a]Mean

[b]Standard deviation

With recalibration of the tests, the means for between fit moved toward the expected value. Again, Form D departed most from the reference values.

In this study, it was found that of the available pool of 230 C&HE items 213, 93%, fit the Rasch model. Further, within each of the five forms, items can be ranked from easiest to most difficult for the six content areas.

To change the test from five forms to one form, the researcher worked with the items which fit the Rasch model. Although items had irregularities, such as high error impact, they still fit the model. A judgmental decision was made by the researcher to maintain items with irregularities to protect the table of specifications which reflects the emphasis of consumer and homemaking education programs.

Items in each content area were arranged from least difficult to most difficult. The larger the negative number the easier the item and the larger the positive number the more difficult the item. The topics were used to identify what the items measured.

The results of item selection based on the difficulty of the item and the judgmental decisions of the researcher are shown in Table 16. Of 120 topics considered to be important, 92 topics are included in the final test. Five of the six content areas had 15 or more topics included. In the family relationship area, only 10 of the 20 topics remained after the calibration.

By knowing the difficulty of the items and the topics being measured, items are available for various purposes. For example, the easiest items

Table 16. Arrangement of items by difficulty and content area

Content Area	Item	Difficulty
FOOD AND NUTRITION		
Safety and sanitation in the kitchen	7C	-3.09
Influence of family values and custom on food patterns	6A	-2.62
Safety and sanitation in the kitchen	2E	-2.42
Safety and sanitation in the kitchen	3E	-2.42
Reliable sources of nutrition information	1A	-2.30
Food preparation	2D	-2.19
Managing the food budget	6D	-1.91
Factors involved in food planning	7A	-1.56
Factors involved in food planning	2B	-1.55
Practices related to preserving nutritive value of food in marketing, prepration, preservation and storage	3C	-1.32
Factors involved in food planning	1B	-1.23
Safety and sanitation in the kitchen	7D	-1.16
Function of nutrients in the body	8E	-1.07
Labeling and food standards	4E	-1.03
Food preparation	2A	- .88
Food preparation	3A	- .77
Special food requirements for individuals	4A	- .72
Factors involved in food planning	7E	- .69
Functions of nutrients in the body	8B	- .66
Jobs requiring a food and nutrition background	3B	- .63
Food preparation	5B	- .55
Practices related to preserving nutritive value of food in marketing, preparation, preservation and storage	5D	- .35
Managing the food budget	5C	- .29
Food habits and health	6B	- .06
Labeling and food standards	1C	- .04
Weight control	1D	- .04
Planning and organizing for buying food	6C	- .01
Labeling and food standards	5A	.04
Special food requirements for individuals	2C	.34
Weight control	8A	.57
Managing the food budget	8D	.80
Weight control	5E	.88
Nutrients and their sources	4C	.90
Factors involved in food planning	8C	1.47

Table 16. (continued)

Content area	Item	Difficulty
CLOTHING AND TEXTILES		
Care of apparel	9B	-1.65
Selection, use and care of equipment	13E	-1.18
Human/nonhuman factors influencing decisions on textiles products	13B	-1.02
Selection, use and care of equipment	9E	- .82
Care of apparel	16E	- .66
Planning and selection of clothing	12D	- .53
Human/nonhuman factors influencing decisions on textile products	16D	- .51
Fiber characteristics	9A	- .46
Values, interests, and attitudes expressions through clothing	15E	- .41
Evaluation of apparel quality	13A	- .39
Social, psychological, cultural and environmental aspects of clothing	11D	- .19
Fashion and the marketplace	11C	- .06
Evaluation of apparel quality	15C	- .01
Human/nonhuman factors influencing decisions on textile products	15D	.00
Construction skills	16B	.28
Construction skills	12A	.29
Planning and selection of clothing	16C	.32
Human/nonhuman factors influencing decisions on textile products	11B	.40
Construction skills	11E	.48
Human/nonhuman factors influencing decisions on textile products	10A	.53
Human/nonhuman factors influencing decisions on textile products	10C	.53
Label information	9C	.58
Construction skills	15A	.64
Planning and selection of clothing	14E	.73
Care of apparel	10D	.95
Construction skills	10E	.97
Construction skills	10B	.98
Color, line and design	11A	1.01
Fabric construction	15B	1.10
Color, line and design	16A	1.42
Human/nonhuman factors influencing decisions on textile products	9D	1.47

Table 16. (continued)

Content area	Item	Difficulty
Planning and selection of clothing	12E	1.48
Selection, use and care of equipment	12B	1.85
Fabric characteristics	14C	1.87
Fabric characteristics	14D	2.22
Fabric characteristics	12C	2.51
Fabric characteristics	13D	3.19
CONSUMER EDUCATION AND MANAGEMENT		
Consumer rights and responsibilities	24C	-1.84
Decision making	20E	-1.84
Pricing	18A	-1.56
Resources	23D	-1.34
Resources	19D	-1.31
Packaging	29D	-1.28
Labels, warranties, guarantees	23C	-1.16
Consumer buying	19B	-1.15
Relationship between the consumer and the economy	24B	-1.08
Relationship between the consumer and the economy	17B	-1.05
Values, goals and standards	21B	- .92
Consumer buying	23B	- .83
Insurance	22B	- .69
Resources	22C	- .67
Advertising	17E	- .44
Relationship between the consumer and the economy	21C	- .38
Decision making	24A	- .32
Management process/practices	23A	- .25
Labels, warranties, guarantees	17C	- .21
Values, goals and standards	18B	- .19
Resources	21A	- .13
Financial planning	22A	- .04
Consumer rights and responsibilities	22E	- .01
Consumer rights and responsibilities	27D	.00
Management procedures/practices	20C	.10
Credit	24E	.24
Credit	19C	.27
Consumer buying	23E	.35

Table 16. (continued)

Content area	Item	Difficulty
Financial planning	24D	.37
Resources	19E	.43
Credit	25D	.48
Resources	17D	.57
Financial planning	19A	.64
Decision making	18E	.69
Management procedures/practices	20A	.86
Consumer resources	21E	1.10
Financial planning	17A	1.36
Management procedures/practices	20B	2.44
FAMILY RELATIONSHIPS		
Multiple roles of family members	30C	-1.08
Communication and interaction skills	28A	-1.00
Characteristics basic to relationships	25E	- .82
Self concept	27C	- .77
Problem solving/decision making	26E	- .76
Laws and regulations affecting families	26C	- .73
Changing roles of individuals in families and society	27B	- .55
Changing roles of individuals in families and society	25C	- .52
Self concept	20D	- .39
Changing roles of individuals in families and society	21D	- .02
Problem solving/decision making	30A	.02
Values and goals	27E	.39
Characteristics basic to relationships	30E	.43
Changing roles of individuals in families and society	29E	.52
Life style	26D	.64
Problem solving/decision making	28E	.69
Changing roles of individuals in families and society	29B	.79
Life style	30D	.80
Problem solving/decision making	26A	.84
Multiple roles of family members	29C	.95
Multiple roles of family members	28D	1.05
Changing roles of individuals in families and society	30B	1.08
Communication and interaction skills	29A	1.13

Table 16 (continued)

Content area	Item	Difficulty
Multiple roles of family members	25B	1.32
Multiple roles of family members	26B	1.32
Family as a stabilizing unit in stress and crises	28B	1.41
Multiple roles of family members	22D	2.00
Problem solving/decision making	25A	2.44
CHILD DEVELOPMENT/PARENTING		
Child abuse	32C	-2.27
Financial consideration of parenting	34D	-2.19
Environmental consideration of parenting	34A	-2.17
Family planning decisions	38D	-1.83
Family planning decisions	37C	-1.78
Child rearing practices	35B	-1.55
Safety and first aid	35D	-1.28
Maternal health and nutrition	33D	-1.22
Child rearing practices	38B	-1.08
Development from conception to birth	30C	-1.08
Physical growth and development	38E	-1.03
Creative expression development	33C	- .93
Social-psychological development	37B	- .83
Family support services	32E	- .82
Social-psychological development	35C	- .73
Child rearing practices	31B	- .72
Intellectual development	35E	- .69
Creative expression development	38A	- .59
Intellectual development	32D	- .58
Intellectual development	31A	- .39
Health and nutrition of children	37A	- .34
Birth of baby	32A	- .25
Intellectual development	37D	- .24
Safety and first aid	36C	- .11
Child care services	31E	- .10
Social-psychological development	33B	.03
Creative expression development	36B	.03
Development from conception to birth	38C	.07
Emotional consideration of parenting	31C	.24
Reproduction	36E	.26
Reproduction	32B	.38

Table 16. (continued)

Content area	Item	Difficulty
Birth of baby	34B	.49
Physical growth and development	35A	.50
Physical growth and development	33A	.55
Reproduction	36D	.57
Maternal health and nutrition	34E	.90
Environmental consideration of parenting	33E	1.36
Maternal health and nutrition	36A	1.45
HOUSING/HOME FURNISHINGS/EQUIPMENT		
Function of housing	45A	-1.99
Evaluation of quality of interior, exterior and mechanical	44E	-1.72
Factors influencing furnishing decisions	42A	-1.69
Safety in the home	42B	- .80
Storage	44D	- .39
Aesthetic aspects of home furnishings	40B	- .19
Legal aspects of housing	40E	- .15
Legal aspects of housing	40A	- .02
Factors influencing equipment decisions	40D	.04
Function of housing	39D	.26
Legal aspects of housing	45D	.30
Energy conservation	45E	.37
Choosing, locating and evaluating housing	41D	.39
Factors influencing housing decisions	43B	.43
Factors influencing furnishing decisions	39A	.64
Storage	41E	.71
Factors influencing furnishing decisions	45C	.75
Factors influencing furniture arrangement	39C	.80
Aesthetic aspects of home furnishing	34C	.85
Legal aspects of housing	41B	.92
Legal aspects of housing	40C	.92
Factors influencing housing decisions	42C	.97
Types of housing	46C	1.02
Factors influencing furniture arrangement	44C	1.10
Selection, maintenance and case of housing, furnishings and equipment	43C	1.12
Legal aspects of housing	46D	1.21
Factors influencing furniture arrangement	46A	1.28
Factors influencing housing decisions	41A	1.31
Selection, maintenance and care of housing, furnishings and equipment	44A	1.31

Table 16. (continued)

Content area	Item	Difficulty
Factors influencing housing decisions	39B	1.32
Relationship between housing selection, available resources, priorities of values and goals, and the decision making process	46B	1.35
Choosing, locating and evaluating housing	44B	1.41
Adapting housing for individual or family needs	45B	1.51
Types of housing	43D	1.56
Legal aspects of housing	43A	1.62
Factors influencing equipment decisions	42E	1.70
Evaluation of quality of interior, exterior and mechanical	46E	1.78
Energy conservation	43E	2.63

may be selected for a pretest which could be administered at the beginning of the year. Further, items in a specific content area may be given to students to determine achievement in that area. With information to indicate the level of a student, items may be selected with difficulties comparable to the student's ability. These examples provide indications for use of the model by practitioners.

SUMMARY AND RECOMMENDATIONS

This study was designed to use the Rasch procedure of item calibration in selecting consumer and homemaking test items. The specific objectives of this study were to calibrate the available pool of consumer and homemaking items using the Rasch procedure which is one area of latent-trait test theory, and to compile calibrated items in a form to be used by secondary consumer and homemaking teachers when assessing achievement.

Some of the research cited on the Rasch and other latent-trait models has recommended that research be conducted to determine the fit of actual data to the models. Of the cited research on Rasch, a large portion was filled with mathematical interpretations of the model. These mathematical interpretations do not provide ready use of the model by practitioners.

The Rasch model is a one-parameter latent-trait model. It takes into account the ability of the examinee and the difficulty of the items but makes no assumption about the ability of the group. The model allows for the item and the person to be placed on the same scale. Items selected using the Rasch model provide more useful information for generalizing about the examinees.

Five forms of a comprehensive consumer and homemaking test were developed. The forms were not statistically equivalent but each form contained 46 items which reflected the emphasis of the topics which were determined to be important in C&HE programs. The test items were

the results of work by various researchers in home economics education. These researchers used curriculum guides, relevant research, legislation, and statistical indices to determine valid items for inclusion in the tests for the specific content area.

The five forms of the test were administered to a sample of Iowa secondary consumer and homemaking students who had participated in four or more semesters of C&HE. For the five forms of the test, there was a total of 1039 examinees. However, each examinee responded to only one form of the test. For Forms A, B, C, D, and E there were 203, 222, 191, 214, and 209 respondents, respectively.

The examinees' responses to the forms were submitted to calibration using the Rasch procedure. The following information was calculated and interpreted for each test form: error impact, person separability index, total t fit (t-test total), between group t (fit between), discrimination index, the Item Characteristic Curve, the departure from expected Item Characteristic Curve, and the map showing the distribution of items and persons.

No item was deleted because it did not fit any one dimension of the model. Items which were deleted were usually those which failed to meet the fit order of the total t fit (t-test total), that is a gradual change in t-test total from item to item and which had error impact at or above .03. Other than that, it was a combination.

For all forms of the test, most items deleted had a t-test total which changes .25 or more from the item which preceded it. This figure of .25 is arbitrary. Two items were deleted from Form A. Item 27 t-test

total was 2.14 whereas the item which preceded it in the fit order was 1.48. The t-test total for 14 increased to 3.26 with the item before it having a t-test total of 2.14. Items 4, 7, and 14 in Form B had t-test totals of 1.59, 2.19, and .67, respectively. Items 4 and 7 t-test totals changed sharply from the items before each of them. Thus, they were deleted. Item 14 t-test total was only a little more than the item before it but it did not fit the expectations for the other information which was used to determine fit. For Form C, three items were deleted. The t-test totals were 3.15 for item 13 with 2.17 for the item preceding it, 1.05 for item 17 with .84 for the item before it, and 1.49 for item 28 with 1.34 for the item before it. Five items were omitted from Form D. Items 3, 4, 18, 31, and 42 had t-test totals of 3.43, 2.19, 3.07, 2.15, and .84, respectively. The t-test totals for the items preceding the items listed for Form D were 3.07, 2.15, 2.19, 1.97, and .61. Four items were omitted from Form E. The t-test totals were 2.21 for item 1, 2.82 for item 6, 2.65 for item 37, and 2.25 for item 39. The respective t-test totals for the item before each of them were 1.97, 2.65. 2.25, and 2.21. Of the 17 items deleted from the five forms, 15 had error impacts greater than .03. Items 4 and 14 of Form B had error impacts of .03. The error impacts for the deleted items were as high as .09.

The Item Characteristic Curve and the departure from expected Item Characteristic Curve for all deleted items showed that the response patterns of the ability groups for the deleted items were highly irregular. For example, the proportion responding to the items did not

progress proportionally from the first group, the poorest ability group to the sixth group, the most able ability group. This pattern was evident in all 17 items. For 10 of the items, the map of items and persons showed that the items were distributed above the mean ability level of the sample responding to the test form. One item in Form B was below the mean ability of the sample responding and three items each for Forms D and E were below the mean ability of each group. Those seven items were deleted.

Less critical for any one item, but also useful in determining fit, were the discrimination indices and the fit between. For all deleted items, the discrimination index was below .50, ranging from .02 to .49. With this index being substantially less than 1.0, the observed Item Characteristic Curve is flatter than expected. The fit between is presented as a SD. When compared with the SD of fit between for the total for each form, the SD for most items was significantly greater than the SD of the test form. But one item in each of Forms B, C, and D had a SD for fit between which was at or below the respective overall SD. They were item 7 in Form B, item 18 in Form C, and item 39 in Form D. For item 18 in Form D the fit between was at the SD of the form. Those four items were deleted.

The person separability index which is equivalent to Kuder Richardson 20 ranged from .68 to .77 for the test forms before items were removed. Forms B and E had the lowest person separability index of .68. Form C had the highest at .77. With recalibration of the test forms, four had person separability indices which improved and the one index remained constant.

The changes in the person separability index from the first analysis to the second analysis were .70 to .71 for Form A, .68 to .69 for Form B, .73 to .76 for Form D, and .68 to .71 for Form E. The index for Form C was constant at .77.

The items deleted before recalibration were determined to be far from the expectation of the model based on interpretation of the calculated information. The application of the model to the consumer and homemaking items showed that 93 percent of the items fit the model. However, of the remaining items fitting the model, some had irregularities which were suspect but were included in the final test to avoid further loss of content validity.

Based upon the results of this study, it is recommended that the final test be recalibrated with additional items including ones for the topics not represented, especially in the family relationship area. If more than one form is used, identical items need to be included in each form for comparisons to be made on the functioning of items with different samples. Items which are written need to match as closely as possible in discrimination levels and which permit minimal guessing.

The intended use of a test is considered when determining sample size. To obtain suitable sample size for stable indices for various usage of consumer and homemaking tests, sample size variation is appropriate for subsequent studies.

The recommendations can provide for better understanding of the Rasch model. From this understanding, the usefulness of the model can be realized for dealing with problems which occur in test development.

A continuation of research on the Rasch model may yield needed information for use of the model by practitioner.

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APPENDIX A: CORRESPONDENCE

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IOWA STATE
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Telephone 515-294-6444

April 19, 1979

To: Superintendents of Selected Iowa Schools

Re: Iowa Consumer and Homemaking Evaluation Project

Evaluation of programs in consumer and homemaking education has been and is a concern of the Department of Public Instruction and teacher education institutions in Iowa. Since the 1976 Legislative mandates there has been increasing activity.

The Department of Home Economics Education at Iowa State University and the home economics consultants in the Department of Public Instruction have been working on development of a variety of means of determining knowledge, skills, and attitudes learned and used by pupils in the consumer and homemaking classes. Perhaps some of your home economics teachers have been a part of these preliminary activities.

We are ready now for a more extensive approach for the next two or three years. To that end we have drawn a random sample of the schools in Iowa offering consumer and homemaking programs. Most of the activities will involve subsamples, but a few will include the full sample. In all cases, only grades 9-12 are involved. Included will be achievement tests, follow-up studies, and information on content of courses. The school (or schools) in your district fell in the sample, and we hope you will agree to the participation of your teacher or teachers.

We are sure you recognize the importance of this activity. In all cases, we will try to coordinate the activity with regular classwork and, of course, will protect the rights of human subjects. When the data collection occurs, we will contact the teacher directly and ask him or her to follow local procedures for administrative approval.

We have not sent this letter to the teacher or to building principals, and would very much appreciate your distributing it as appropriate.

Ruth P. Hughes

Ruth P. Hughes, Head
Home Economics Education

Gladys Grabe

Gladys Grabe, Consultant
Department of Public Instruction

APPENDIX B: TABLES OF SPECIFICATIONS FOR FORMS B, C, D, AND E

Table 17. Table of specifications - Form B

Content Area	Item Numbers
FOOD AND NUTRITION	
Factors involved in food planning	1, 2
Jobs requiring a food and nutrition background	3
Nutrients and their sources	4
Food preparation	5
Food habits and health	6
Labeling and food standards	7
Functions of nutrients in body	8
CLOTHING AND TEXTILES	
Care of apparel	9
Construction skills	10, 16
Human/nonhuman factors influencing decisions on textile products	11, 13
Selection, use and care of equipment	12
Fabric finishes	14
Fabric construction	15
CONSUMER EDUCATION AND MANAGEMENT	
Relationship between the consumer and the economy	17, 24
Values, goals and standards	18, 21
Consumer buying	19, 23

Management procedures/practices	20
Insurance	22

FAMILY RELATIONSHIPS

Problem solving/decision making	25
Multiple roles of family members	26
Changing roles of individuals in families and society	27, 29, 30
Family as a stabilizing unit in stress and crisis	28

CHILD DEVELOPMENT/PARENTING

Child rearing practices	31, 35, 38
Reproduction	32
Social-psychological development	33, 37
Birth of the baby	34
Creative expression development	36

HOUSING/HOME FURNISHING/EQUIPMENT

Factors influencing housing decisions	39, 43
Asesthetic aspects of home furnishings	40
Legal aspects of housing	41

Table 17. (continued)

Content area	Item Numbers
Safety in the home	42
Choosing, locating and evaluating housing	44
Adapting housing for individual and family needs	45
Relationship between housing selection, available resources, priorities of values and goals, and the decision making process	46

Table 18. Table of specifications - Form C

Content area	Item numbers
FOOD AND NUTRITION	
Labeling and food standards	1
Special food requirements for individuals	2
Practices related to preserving nutritive value of food in marketing, preparation, preservation and storage	3
Nutrients and their sources	4
Managing the food budget	5
Planning and organizing for buying food	6
Safety and sanitation in the kitchen	7
Factors involved in food planning	8
CLOTHING AND TEXTILES	
Label information	9
Fabric finishes	10
Fashion and the marketplace	11
Fabric construction	12
Fiber characteristics	13, 14
Evaluation of apparel quality	15
Planning and selection of clothing	16

CONSUMER EDUCATION AND MANAGEMENT

Labels, warranties, guarantees	17, 23
Consumer problems	18
Credit	19
Management procedures/practices	20
Relationship between the consumer and the economy	21
Resources	22
Consumer rights and responsibilities	24

FAMILY RELATIONSHIPS

Changing roles of individuals in families and society	25
Laws and regulations affecting families	26
Self concept	27
Functions of the family	28
Multiple roles of family members	29, 30

CHILD DEVELOPMENT/PARENTING

Emotional consideration of parenting	31
Child abuse	32
Creative expression development	33
Child rearing practices	34

Table 18. (continued)

Content area	Item number
Social-psychological development	35
Safety and first aid	36
Family planning decisions	37
Development from conception to birth	38
HOUSING/HOME FURNISHING/EQUIPMENT	
Factors influencing furniture arrangement	39, 44
Legal aspects of housing	40
Aesthetic aspects of home furnishings	41
Factors influencing housing decisions	42
Selection, maintenance and care of housing, furnishings and equipment	43
Factors influencing furnishing decisions	45
Types of housing	46

Table 19. Table of specifications - Form D

Content area	Item numbers
FOOD AND NUTRITION	
Weight control	1
Food preparation	2
Nutrition throughout the life cycle	3
Factors involved in food planning	4
Practices related to preserving nutritive value of food in marketing, preparation, preservation and storage	5
Managing the food budget	6, 8
Safety and sanitation in the kitchen	7
CLOTHING AND TEXTILES	
Human/nonhuman factors influencing decisions on textile products	9, 15, 16
Care of apparel	10
Social, psychological, cultural and environmental aspects of clothing	11
Planning and selection of clothing	12
Fabric construction	13, 14
CONSUMER EDUCATION AND MANAGEMENT	
Resources	17, 19, 23
Decision making	18

Table 19. (continued)

Content area	Item numbers
HOUSING/HOME FURNISHING/EQUIPMENT	
Function of housing	39
Factors influencing equipment decisions	40
Choosing, locating and evaluating housing	41
Evaluation of quality of interior, exterior and mechanical features of housing	42
Types of housing	43
Storage	44
Legal aspects of housing	45, 46

Table 20. Table of specifications - Form E

Content area	Item numbers
FOOD AND NUTRITION	
Fads and fallacies	1
Safety and sanitation in the kitchen	2, 3
Labeling and food standards	4
Weight control	5
Food preparation	6
Factors involved in food planning	7
Functions of nutrients in the body	8
CLOTHING AND TEXTILES	
Selection, use and care of equipment	9, 13
Construction skills	10, 11
Planning and selection of clothing	12, 14
Values, interest and attitudes expression through clothing	15
Care of apparel	16
CONSUMER EDUCATION AND MANAGEMENT	
Advertising	17
Decision making	18, 20
Resources	19
Consumer resources	21

Table 20. (continued)

Content area	Item numbers
HOUSING/HOME FURNISHING/EQUIPMENT	
Relationship between housing selection, available resources, priorities of values and goals and the decision making process	39
Legal aspects of housing	40
Storage	41
Factors influencing equipment decisions	42
Energy conservation	43, 45
Evaluation of quality of interior, exterior and mechanical features of housing	44, 46

APPENDIX C: COMPREHENSIVE CONSUMER AND HOMEMAKING TEST FORMS A, B, C, D, AND E

May 1, 1980
Form A01

Comprehensive Consumer and Homemaking Test

Directions: Read each question carefully and decide on the best answer. Write the letter corresponding to your choice on the line to the left of the item.

_____ 1. The most reliable source of nutrition information is

a. sales person in a health food store.
b. home economics extension agent.
c. nutrition article in a popular magazine.

_____ 2. Which is the best order in which to bake the following meal?

meatloaf (350°, 1 hour)
green bean casserole (350°, 1/2 hour)
banana-nut cake from mix (350°, 3/4 hour)

a. meatloaf then cake after 15 minutes, then casserole after another 15 minutes
b. put all three in the oven at once and then remove as they get done
c. meatloaf and cake together then casserole 1 hour later

_____ 3. Work simplification principles call for heavy equipment to be stored

a. above shoulder level.
b. near waist level.
c. below knee level.

_____ 4. Dave, age 17, ate the following meals

Breakfast	Lunch	Evening Meal
orange slices	roast beef sandwich	salisbury steak
oatmeal with milk	celery sticks	rice
toast	oatmeal cookies	corn
margarine	milk	whole wheat bread
milk		ice cream sundae
		milk

In which food group does Dave need one more serving?

a. bread and cereal group
b. milk group
c. fruit and vegetable group

_____ 5. Nutrition labels can best be used to compare nutritional value of

a. canned lima beans with frozen spinach.
b. fresh potatoes with frozen French fries.
c. hamburger with pork roast.

_____ 6. Day to day eating patterns are influenced by

a. family customs.
b. neighbor's religion.
c. friend's leadership.

_____ 7. Which of the following would be the least expensive cut of meat per serving?

a. T-bone steak
b. round steak
c. rib eye steak

_____ 8. The recommended weight for a female adult as she grows older

a. increases gradually with each year of age.
b. remains the same as it was at 25 years of age.
c. decreases with each year of age.

_____ 9. Which fiber has excellent blending versatility?

a. silk
b. polyester
c. nylon
d. rayon

_____10. Non-human factors which influence decisions relating to the acquisition of textile products are

a. peers, sales personnel, packaging.
b. peers, sales personnel, celebrities.
c. brand, packing, advertisements.
d. advertisements, peers, brands.

_____11. In selecting a garment to give the impression of height and to create a slender appearance, one should choose a garment with a

a. princess style in solid color.
b. different color of yoke.
c. dark skirt and a light blouse.
d. contrasting color horizontal band on the skirt.

_____12. When you make a blazer from cotton fabric, sewing skills would be more important if you used

a. denim.
b. corduroy.
c. poplin.
d. seersucker.

_____13. Consumers need information when selecting and purchasing textile products because of variety in

a. quality, use, choice.
b. use, likes, dislikes.
c. choice, care, likes.
d. likes, dislikes, quality.

_____14. Which of the following is not a basic consumer right?

a. choice
b. a fair price
c. be heard
d. be informed

_____15. Blending polyester with wool and cotton will

a. increase durability, increase cost.
b. increase care, increase cost.
c. increase durability, decrease cost.
d. increase cost, decrease durability.

_____16. A straight line in a dress tends to express which of the following?

a. grace
b. activity
c. restlessness
d. rigidity

_____17 As the income of a family increases they are likely to spend a smaller percentage of their income on

a. insurance.
b. travel.
c. taxes.
d. food.

_____18. Two boxes of cereal are the same type and quality. The kind of information that would help you decide which one is the better is the

a. size of package.
b. package marking "on sale."
c. cost per ounce of net weight.
d. label reading "10¢ off."

_____19. A budget should be set up using the paycheck's

a. net amount.
b. gross amount.
c. gross or net amount.
d. amount left after the promised payments are made.

_____20. The decision-making process in making consumer choices involves the following steps

1. seek alternatives or possible course of action
2. make a list of all possible courses of action
3. choose an alternative
4. identify the problem
5. examine alternatives

Select the most appropriate sequence for these steps from the list below.

a. 4 1 2 5 3
b. 4 2 1 5 3
c. 4 1 5 2 3
d. 4 2 5 1 3

_____21. Which of the following statements is most accurate?

a. Homemaking has a value which can be estimated in dollars.
b. Homemaking is useful, but not everyone puts a dollar value on it.
c. The dollar value of the tasks of homemaking is the same for all families.
d. A dollar value can easily be placed on any tasks the homemaker does.

_____22. The total cost of car ownership includes

a. repairs, insurance and gasoline.
b. depreciation plus gasoline.
c. insurance, licenses, and fuel.
d. operating costs and depreciation.

_____23. Flora works during the week, and must do quite a few household tasks on Saturday. Even though Sam helps her, she finds that between her household tasks and taking care of the baby, she gets very tired.

One of Sam's best friends who works on management made the following suggestions. Which one is <u>best</u> for Flora to use?

a. Do all the hard jobs first.
b. Make a strict time plan and stick to it.
c. Avoid all interruptions.
d. Do similar kinds of tasks together.

_____24. A local ice cream store owner decides to sell hot fudge sundaes for 85 cents each. Every sundae now costs the store owner 95 cents. The store owner

a. is currently making a profit by selling sundaes.
b. may be breaking the law by selling sundaes below cost.
c. needs to closely examine the cost of producing sundaes.
d. will sell more sundaes so the production costs decreases.

___25. Suppose that in the years to come you were part of a crew landing on a large planet to settle and live. You will have been prepared as well as possible for this new life, but still you and the others will have to make decisions.

Which of the following is the best advice for making these decisions?

a. Decide first what resources are available, since in a new place you must know what your resources are before making any decisions.
b. The first decision to make is what to do; finding ways to do it should follow.
c. There will be little need to consider conflicts of goals. All will have the same goal: to survive!
d. Once a choice is made, there will be no need for judging whether it was a wise choice - you won't have time.

___26. Which is the correct order?

a. Central and satellite decisions are made together.
b. Satellite decisions are made before central decisions.
c. Central decisions are made before satellite decisions.
d. The order doesn't matter.

_____27. The life of the Eskimo has been hard for many years. Recently, however, government programs have been directed toward improving conditions in the north. One Canadian project provides permanent wooden homes for the Eskimos. The government plans to replace the igloos with these new homes. These homes require more care than the igloos, and the women now spend less time helping their husbands supplement their income.

The power of the Eskimo wife, in relation to the power of her husband, should be expected to

a. increase.
b. decrease.
c. remain the same.

_____28. Committee members appointed to choose the kind of dance a class was to have were divided between those who wanted a December formal and those who wanted an informal square dance in the spring. Finally, they decided to have a formal dance in the spring. What method of conflict resolution appears to have been used?

a. submission
b. conversion
c. compromise
d. compartmentalization

_____29. A decision can best be described as a

a. conflict resolution.
b. choice.
c. goal in mind.
d. resource.
e. process.

_____30. In order to make central decisions, which would be the best group of items to consider?

a. facts, attitudes, possible solutions
b. time, energy, money
c. role, position, status
d. cost, location, hours

_____31. In helping children develop sound language patterns, parents should

a. use short words and sentences.
b. use baby talk.
c. speak clearly in normal tones.
d. speak slowly and emphasize each word.

_____32. What is the last thing that happens in the delivery process?

a. Baby is born.
b. Uterine bleeding stops.
c. Placenta is expelled.
d. Breastmilk is produced.

_____33. Which statement best describes newborn babies?

a. They are extremely delicate and fragile.
b. They smile in response to their mother's attention.
c. They cry when hungry or uncomfortable.
d. They need to be fed on schedule.

_____34. Whose behavior do children imitate first?

a. friends
b. teachers
c. peers
d. family

_____35. When using words, a 2 year old child is likely to

a. start putting five or more words into sentences.
b. start putting two or three words together.
c. constantly ask questions.
d. babble and slur the words.

_____36. Which is a symptom for concern during pregnancy?

a. decrease in the amount of urine passed
b. more frequent urination
c. mucous discharge from the vagina
d. shortness of breath during the last trimester

_____37. Which of the following would not be a sign that an infant might be ill?

a. glassy-looking eyes
b. feverish face
c. unusually hungry
d. listlessness

_____38. A child's ability to be creative may be lessened when parents

a. present situations that stimulate curiosity.
b. permit the child to explore.
c. accept the child's ideas.
d. provide a model for the child to copy.

_____39. All of the following are true of fibers used in carpeting except which one?

a. Wool and nylon are generally durable and soil-resistant.
b. Rayon is often blended with other fibers.
c. Acrylic fibers may make rugs highly flammable.
d. Cotton fibers make rugs soil-resistant in heavy traffic lanes.

_____40. Rescheduling the payments on a loan so as to pay the loan off in a longer period of time than originally agreed on is

a. reducing the balance.
b. consolidating the loan.
c. refinancing the loan.
d. resuming credit.

_____41. The following ad for an apartment appeared in the paper: "2 br. apt. with cent. A/C, W/W carpet, Kit appl., gas H & C water furn."

a. The apartment has two bedrooms.
b. The renter pays his/her own utilities.
c. A refrigerator and range are furnished.
d. The apartment is completely carpeted.

_____42. When buying home furnishings, the shopper is more likely to be satisfied with a purchase if he/she

a. ignores anything the saleman says.
b. buys from the furniture store with the lowest prices.
c. accepts a verbal guarantee of satisfaction.
d. shops in several stores to compare values and prices.

_____43. Requirements of the Truth-in-Lending law on mortgage loan procedures include all of the following except

a. a Truth-in-Lending statement must be given the buyer at the time of closure.
b. a Truth-in-Lending statement must include the annual or effective percentage rate of interest.
c. the annual percentage rate must be given at the time of loan application.
d. any additional charges made for pre-payment of the loan must be specified in the Truth-in-Lending statement.

_____44. Of the following fillings used in upholstered pieces, which one is least likely to retain shape and appearance over a long period?

a. down
b. urethane
c. cotton felt
d. dacron polyester fiberfill

_____45. Of the following possible ways of choosing a house, which is likely to result in a choice that is most satisfying to both Jane and Harry?

a. Harry finds a place for them to live, since Jane is busy in school.
b. Both of their parents choose a house for them and make a down payment as a wedding present for them.
c. Harry and Jane talk over their needs and hunt together for their living quarters.
d. They wait until after they are married to find a place, and Jane does it while Harry is at work.

_____46. A tall narrow room may be made to seem shorter and wider by

a. placing a long sofa across a narrow wall.
b. placing a tall cabinet on the narrow wall.
c. painting the ceiling a darker color than the walls.
d. dropping the ceiling color to a trim or molding several inches below the ceiling.

Please check to see if you have responded to each item.

Thank you for the time you spent in responding to this test.

Department of Home Economics Education
Iowa State University
120

May 1, 1980
Form B01

Comprehensive Consumer and Homemaking Test

Directions: Read each question carefully and decide on the best answer. Write the letter corresponding to your choice on the line to the left of the item.

_____ 1. Maria and Pedro are having a sit down dinner party for 8 people and have room to seat the 8 people at a table. They are allowing each person to determine their own serving size. What type of meal service would be appropriate?

a. family
b. formal
c. apartment

tuna-noodle casserole
cauliflower
roll and margarine
pear slices
milk

_____ 2. The major aesthetic error in the above menu is the lack of variation in

a. color.
b. temperature.
c. flavor.

_____ 3. Which of the following food service jobs uses a food and nutrition background?

a. headwaiter-waitress
b. dishwasher
c. baker's helper

_____ 4. The food which would have the higher nutritive value for the amount of money spent would be

a. cabbage compared to lettuce.
b. apples compared to kidney beans.
c. bananas compared to oranges.

_____ 5. Tim is planning to serve chicken, potatoes, and broccoli. Which of the following is the best method of preparation to conserve fuel energy?

a. Bake the chicken, boil the potatoes, and steam the broccoli.
b. Bake the chicken, bake the potatoes, and bake the broccoli.
c. Bake the chicken, fry the potatoes, and boil the broccoli.

_____ 6. Children start to learn good eating habits at an early age. Adults can help them the most by

a. teaching them to use a spoon to pick up their food.
b. urging them to eat all the food they are served.
c. varying the kind, temperature and color of their food.

_____ 7. Which of the following is required by law on food labels?

a. brand name
b. serving size
c. product picture

_____ 8. The primary function of carbohydrates in the body is to

a. build cells.
b. regulate heart beat.
c. provide energy.

_____ 9. The care of a garment would be most influenced by the

a. design on fabric.
b. cost of the garment.
c. expected life of the fabric.
d. fiber content of the fabric.

_____10. Which of the following is the correct order of work?

a. mark, layout, cut, staystitch
b. layout, mark, cut, staystitch
c. layout, cut, staystitch, mark
d. layout, cut, mark, staystitch

_____11. Consumers can improve the quality of textile products by communicating with retailers and manufacturers. Which of the following will improve textile products?

a. changing buying patterns
b. complaining to friends
c. remaining silent
d. expressing satisfaction

_____12. An incorrect reason for using a sewing machine light is that

a. additional light is necessary.
b. eye strain is relieved.
c. sewing accuracy is improved.
d. accidents may be prevented.

_____13. Expressing satisfaction regarding a product to the retailer will lead to

a. increased prices.
b. changes in products.
c. increased goods and services.
d. fewer products.

_____14. Finish adds to the safety feature of a textile product because it

a. increases the life of the product.
b. protects the wearer.
c. increases the cost.
d. allows for versatility in a product.

_____15. The basic weaves in fabric construction are

a. warp, twill, plain.
b. plain, twill, satin.
c. weft, twill, warp.
d. plain, satin, weft.

_____16. Safety hazards in the clothing construction process can <u>best</u> be avoided by

a. practicing a step several times.
b. asking someone for help.
c. reading instruction booklets.
d. watching someone else.

_____17. Mary's mother and father are elderly. She worries about their illnesses and the possiblity of their sudden death. The parents have made no will, and Mary thinks they have only a small estate. The <u>best</u> action for Mary to take involves

a. asking her parents to indicate on paper what they want done with the estate and have them sign it.
b. avoiding the topic because the estate is small and no will is necessary.
c. avoiding the subject of a will; it will upset her parents.
d. suggesting to the parents that they hire a lawyer to draw up a legal will.

_____18. An important factor for establishing priorities for basic needs is identifying one's

a. standards.
b. time.
c. money.
d. values.

_____ 19. Mary has limited money to provide books for her two-year old son John. The widest variety of books for John can be obtained by

a. purchasing books at rummage sales.
b. purchasing through a monthly book club at reduced prices.
c. exchanging books with families in the neighborhood.
d. borrowing from the local library.

_____ 20. You may spend <u>more</u> than average time to do a household task if you

a. plan your work.
b. dislike your work.
c. like the work.
d. have time pressures.

_____ 21. The use of personal resources should first be planned to meet

a. desires.
b. wants.
c. needs.
d. standards.

_____ 22. The <u>most</u> essential type of automobile insurance is

a. comprehensive.
b. collision.
c. bodily injury.
d. liability.

_____ 23. An individual's needs for consumer goods and services

a. increase during adolescent years.
b. decrease from adolescence to adulthood.
c. remain the same after adulthood is reached.
d. vary for each stage of the life cycle.

_____ 24. The group of people hurt <u>most</u> by inflation is

a. retirees on a fixed income.
b. business persons with long-term debts.
c. union members on an annual contract.
d. salesmen who receive a percentage of the gross receipts.

_____ 25. Jane, in making a decision about what to do in the evening, frequently decides on the basis of what will be the most fun. Which step in the decision-making process is she <u>most</u> likely to be omitting?

a. Set a suitable goal.
b. Check her resources.
c. Consider possible alternatives.
d. Consider consequences of possible alternatives.

_____26. As wives become employed, their position at home

a. does not change.
b. becomes less powerful.
c. becomes more powerful.

_____27. There will be jobs for both bookkeepers and nurses in the future, but your chances of getting a job are better if you are a nurse. Why is this so?

a. There is less need for any kind of record keeping.
b. Only women are wanted to fill nursing positions.
c. The need for service workers is increasing rapidly.
d. Bookkeeping pays so well that it is hard to get such a job.

_____28. Some unions are asking for a shorter work week. There are people who predict that if the work week is shortened, families will tend to be split apart. This may or may not be true, but which of the following statements would support their position?

a. More women will be employed outside the home.
b. Men will work overtime to increase their income.
c. Families will be more likely to share in the work of the home.
d. Men will have more time to help around the house.

_____29. Position and roles of women changed more quickly during the five years of World War II than in all the 25 years before. The reason is that

a. families then became consumers instead of producers.
b. change is more rapid during periods of upheaval.
c. cultural lag finally caught up.
d. the women wanted more money to buy things for their families.

_____30. Which of the following, as a consequence of the Industrial Revolution, caused changes in the role of women?

a. There was more and harder work that had to be done.
b. Women got the right to vote and demanded other rights also.
c. Work that had previously been done in the home was now being done in factories.
d. It was necessary for women to help men with their accustomed role of family protector.

_____31. To prevent problems at mealtime, a parent should

a. make the child eat everything served.
b. insist on large servings.
c. promise dessert as a reward.
d. provide pleasant conversation.

__32. Where is an egg cell usually fertilized?

a. uterus
b. vagina
c. Fallopian tube
d. ovary

_____33. If a 3 or 4 year old has an imaginary friend, it indicates that he/she

a. needs affection.
b. has a vivid imagination.
c. is seeking more attention from his/her parents.
d. needs a brother or sister.

_____34. What is the first opportunity to establish mother-infant bonding?

a. Breastfeed the newborn infant.
b. Place the newborn on the mother's body.
c. Create a loving home for the new born.
d. Have the newborn stay in the same room as mother.

_____35. When children are learning to dress themselves, provide clothing with

a. large buttons.
b. small buttons and snaps.
c. zippers in the back.
d. separating zippers.

_____36. With what kind of play activities can a 2 year old be most successful?

a. coloring pictures.
b. cutting with child-size scissors.
c. stacking books into towers of four blocks high.
d. riding a tricycle.

_____37. When a child receives adequate expression of affection from its parents, the child will

a. find it easier to accept himself/herself and others.
b. learn to expect the parents to give him/her gifts as an expression of their affection.
c. become dependent on others for constant displays of affection.
d. always be obedient as a way of returning their love.

_____38. Sue, age 3, took several cookies against her parent's orders. The parent should tell Sue that

a. she is a bad girl.
b. her behavior makes the parent unhappy.
c. she'll get punished next time.
d. she'll grow up to be a thief.

_____39. Your family expects to have a limited income for the next 5 years but should have a marked increase in income at that point. Which of the following loans would be the best for your family?

a. graduate payment mortgage
b. mother-in-law mortgage
c. roll-over mortgage
d. variable rate mortgage

_____40. Of the following wall treatments, which would be most effective in making a north room look larger and lighter?

a. dark wall paneling, light ceiling
b. light wall paneling, dark ceiling
c. pale yellow unpatterned walls and off-white ceiling
d. paper in larger, brighter floral design and off-white ceiling

_____41. Of the following which is the best definition of "lease?"

a. a legal document specifying rights of landlords
b. a legal document specifying responsibility of tenants
c. a legal document specifying rights and responsibilities of tenants and landlords
d. a legal document protecting the tenant from the landlord

_____42. Which of the following presents a safety hazard?

a. lighted centers of interest
b. low wattage lights in halls and bath
c. bright background lighting in living areas
d. light with switch inside shower

_____43. Which of the following is <u>most</u> helpful in assuring that a house will <u>not</u> be eventually surrounded by a business area?

a. building codes
b. zoning ordinances
c. residential ordinances
d. appearance of neighborhood

_____44. Satellite communities are

a. communities in space.
b. experimental commune communities.
c. villages built around urban downtown.
d. small, isolated rural communities.

_____ 45. After the Andersons moved into their new home they made a family project of building in bookcases in several rooms, additional storage cupboards, special sewing area storage, and a basement workshop and storage. Which of the following statements concerning the value of their property is true?

a. Since many people have hobbies, the additions to the house are sure to increase the value of the property to more than pay for the cost and the work.
b. Any housing additions will increase the value of the housing in the market to exceed the cost.
c. Additions beyond basic needs rarely increase the value of property.
d. Additions to a house to meet one family's need do not necessarily make it more valuable to another.

_____ 46. The Brown family is very conscious of the need to conserve space as new housing is provided, but desires privacy and space for gardens, exercise and recreation. Which of the following would most likely meet their needs?

a. co-operatives
b. condominiums
c. planned unit developments
d. urban homesteading

Please check to see if you have responded to each item.

Thank you for the time you spent in responding to this test.

Department of Home Economics Education
Iowa State University

May 1, 1980
Form C01

Comprehensive Consumer and Homemaking Test

Directions: Read each question carefully and decide on the best answer. Write the letter corresponding to your choice on the line to the left of the item.

_____ 1. Which government agency is responsible for investigating the truth of a company's advertising?

a. Federal Trade Commission
b. Federal Bureau of Investigation
c. Environmental Protection Agency

_____ 2. Jane, age 15, ate the following meals.

Breakfast	Lunch	Evening Meal
tomato juice	meatloaf sandwich	pork chop
oatmeal with milk	cabbage salad	baked potato
toast	carrot sticks	apple-celery salad
margarine	baked apple	roll
	milk	vanilla ice cream
		iced tea

In which food group does Jane need one more food to meet the recommended number of servings?

a. bread and cereal group
b. fruit and vegetable group
c. milk group

_____ 3. Which of the following methods preserves the most nutrients in fresh spinach?

a. Cover and cook 30 minutes in a butter sauce.
b. Cover and boil 20 minutes in a large amount of water.
c. Cover and simmer 10 minutes in a small amount of water.

_____ 4. Skim milk as compared to whole milk has

a. more minerals.
b. the same amount of minerals.
c. fewer minerals.

_____ 5. Which is the most economical size of canned tomatoes when comparing unit prices?

a. 8 oz. @ $.35
b. 16 oz. @ $.56
c. 28 oz. @ $.89

_____ 6. If you plan to serve punch to 16 people and decide to give 1/2 cup servings and figure two servings per person, how many gallons of punch would you make?

a. 1/2
b. 1
c. 1-1/2

_____ 7. Accidents are likely to occur in a kitchen when the individual preparing food has

a. many distractions.
b. few distractions.
c. no distractions.

_____ 8. Jim is attending debate club this evening while his brother Bill is attending basketball practice. When comparing the nutritional needs of Bill and Jim for the evening meal, Bill will need more

a. calories.
b. protein.
c. iron.

_____ 9. You are purchasing fabric to make a garment. Which of the following is <u>not</u> a factor in fabric selection?

a. end use
b. fiber content
c. dye number
d. thread count

____ 10. Durable press finish was developed to be used on which fabric?

a. cotton
b. burlap
c. acetate
d. linen

____ 11. Complaints to retailers and manufacturers by consumers about textile products would <u>not</u> result in

a. development of new products.
b. removal of faulty products.
c. addition to supply of existing products.
d. research on existing products.

____ 12. Damask fabric uses which of the following weaves?

a. plain
b. twill
c. crepe
d. satin

____ 13. A garment that tends to be wrinkle resistant is generally made of fibers that possess

a. tenacity.
b. resiliency.
c. elasticity.
d. flexibility.

____ 14. Which natural fiber can be a filament?

a. wool
b. flax
c. silk
d. cotton

____ 15. Consumers have responsibility for selecting products with an end use in mind. This end use is not likely based on

a. durability.
b. comfort.
c. fit.
d. quantity needed.

____ 16. Jane has evaluated her wardrobe. She makes a list of the items she needs but while shopping sees a dress she wants. Jane should

a. purchase the dress.
b. purchase the dress later.
c. replace an item on list with the dress.
d. select based on her list.

____ 17. Below are parts of labels from two different cans of beef stew.

STORE BRAND #1 BEEF STEW
Ingredients: Cooked beef, potatoes, peas, beef fat, corn starch.
Net. Wt. 24 oz.

STORE BRAND #2 BEEF STEW
Ingredients: Potatoes, water, carrots, tomatoes, onion, coloring, spice, flavoring, cooked beef. Net. Wt. 24 oz.

Which beef stew has more meat in it?

a. STORE BRAND #1
b. STORE BRAND #2
c. Both have the same amount of meat
d. Not enough information is provided

____ 18. You buy four new tires from a local service station for $100 and later discover that they are retreads. The service station operator says you must have switched tires and refuses to refund your money. The agency that would finally settle this complaint is the

a. Better Business Bureau.
b. Small Claims Court.
c. Chamber of Commerce.
d. Department of Transportation.

____ 19. The Fair Credit Reporting Act states that a person may

a. take his/her credit report home for one day and study it
b. check the accuracy of the information in his/her credit file.
c. pay a small fee to see a credit report that kept him/her from getting credit.
d. see his/her credit report at the credit bureau only if credit has been refused.

____ 20. Suppose a working wife was willing to spend money in order to save herself time and effort. Which would she do?

a. Buy only the best quality meat, fruits, and vegetables.
b. Buy what looks appetizing without spending time to make shopping lists.
c. Buy prepared and partially prepared foods.
d. Buy home-grown foods in season to freeze for later use.

____ 21. Lifestyles change during inflation because

a. salaries go up and each dollar buys more.
b. salaries remain the same while prices increase.
c. the value of the dollar increases.
d. it takes more dollars to buy the same amount of goods.

____ 22. Which of the following statements describes what Social Security payments are designed to do?

a. Replace some of the earnings lost when the wage earner retires, dies or is disabled.
b. Provide an income in case of a short illness.
c. Provide an income during periods of unemployment.
d. Refund the amount of payments if you stop working.

____ 23. A written statement attached to an article or a product describing its essential characteristics is the

a. guarantee.
b. label.
c. warranty
d. price tag.

____ 24. The Blacks have not made the last four payments on their car. They did not tell the credit company that they couldn't make the payments. The credit company has started garnishment proceedings against Mr. Black. Such action could possibly have been avoided if Mr. Black had

a. explained to the credit company why he could not make the payments.
b. told his employer.
c. returned the car to the dealer.
d. done nothing, as there was no way to avoid such action.

____ 25. Possible results of an increase in the number of married women employed may be

a. a decrease in the number of families who are poor.
b. fewer money worries for the father.
c. an increase in the amount of things families buy.
d. all of the above.

____ 26. Among conditions in the United States at the present time at least two stand out: pressure for legislation guaranteeing equal rights of citizens, and increasing military commitments overseas. What effect would these be likely to have upon the employment of women?

a. Neither would have any effect.
b. More women might work because of the military situation, but equal rights doesn't have anything to do with women working.
c. Equal rights is directly concerned with women who work, but our military commitments won't have any effect.
d. Both have an effect on the employment of women.

____ 27. Brown's youngest child has recently married and left home. Mr. Brown received enough raises over the years to maintain their standard of living. Still, Mrs, Brown is thinking about returning to the kind of work she did before the children came.

Which of the following would most clearly explain her decision?

a. general economic conditions
b. the husband's job
c. children's attitude toward her working
d. period in her life
e. inflation

____ 28. Which of the following reasons would explain why Mrs. Brown had not been employed?

a. The family did not need the money
b. Mrs. Brown's family did not want her to be employed
c. Mrs. Brown liked to stay home with her children
d. All of the above
e. Cannot tell from the information given

____ 29. In families where both the wife/mother and the husband/father are employed, studies show that most of the housework is done

a. by the wife/mother.
b. by the husband/father.
c. by both about equally.

____ 30. Miss Brown, who works full time in the welfare office, also takes care of her elderly mother who lives with her. Could Miss Brown correctly be said to have a dual role?

a. Yes, because welfare work includes working with families.
b. Yes, because she is managing a household and working in an office.
c. No, because she is not married and presiding over a household.
d. No, because women without children have only one dominant role.

____ 31. How would a person go about developing confidence in his/her ability to be a parent?

a. Accept yourself as you are.
b. Specialize in what you do best.
c. Set attainable goals for yourself.
d. Find opportunities to work with children.

____ 32. Which is an example of child abuse?

a. sending the child to his/her room without dessert
b. not allowing TV viewing for 2 weeks
c. constantly criticizing the child
d. making the child sit on a chair for an hour for punishment

____ 33. What kinds of playthings are <u>least</u> effective in stimulating a child's creative self-expression?

a. paints, clay, tools
b. wind-up or mechanical toys
c. blocks and manipulative toys
d. coloring books and crayons

____ 34. Television influences children by showing

a. cartoon characters acting nice to each other.
b. characters which children imitate.
c. many realistic family scenes
d. few violent shows.

____ 35. When does a baby's sense of trust begin to develop?

a. at birth
b. when the baby can perform basic skills successfully
c. when the baby starts to talk
d. when the baby starts to walk

____ 36. If a child swallows a poison, you should

a. try to make the child vomit or throw up immediately.
b. call a doctor or poison control center.
c. keep the child active and moving.
d. have the child drink soda pop.

____ 37. Which situation provides an opportunity to use parenting skills when a child does not live in the home?

a. work with young people at the "Y"
b. send money to needy children
c. write newspaper stories about children
d. lecture students in the classroom

____ 38. During which period of pregnancy are serious birth defects likely to occur?

a. conception to 3 months
b. 3 to 5 months
c. 5 to 7 months
d. 7 to 9 months

____ 39. Which of the following is <u>not</u> true?

a. A large chair or sofa covered in a color contrasting to the background color will seem smaller.
b. Using less intense colors for large areas will allow them to serve as backgrounds.
c. Using bright colors for small, decorative items will attract attention.
d. Using multi-colored carpeting in traffic areas will help hide soil.

____ 40. The Smiths have a homeowner's insurance policy. Last week the plumbing on the second floor froze and burst. Damage was done to carpeting, downstairs ceilings and some furniture. When they tried to collect on the policy, they were told this was not included in their coverage. Which of the following policies must they have had?

a. Broad Coverage (HO 2)
b. Standard Coverage (HO 1)
c. Comprehensive Coverage (HO 5)
d. All Risk Coverage (HO 3)

____ 41. Of the following, which floor coverings of similar color, design and texture will make a room seem larger?

a. small, scatter rugs
b. area rugs under furniture groupings
c. wall-to-wall carpeting
d. a large rug smaller than room size

____ 42. The most important things to consider about an energy source when attempting to decide what could be used in homes are

a. power lines, maintenance, installation, and location.
b. tradition, research, popularity, and profit.
c. transportation, supply, cost, safety, and life-style.
d. technology, economy, culture, and construction.

____ 43. Of the following, which indicates the highest quality of construction in sofas?

a. flat, zigzag steel springs
b. coil springs
c. light weight muslin coverings underneath
d. flat wooden braces underneath

____ 44. All of the following are ways of cutting costs of heating and air conditioning EXCEPT:

a. an open fireplace.
b. large window areas with wide overhang on the south.
c. ventilating fans or cross ventilation in attic area.
d. heavy insulation above ceiling, in walls, and under floor.

____ 45. Furnishings that will make a small room seem larger include all the following EXCEPT:

a. a few large upholstered pieces: sofa and chairs
b. sofa and chairs without arms or with small, slender arms and/or legs
c. furniture built on a small scale
d. a minimum of furnishings and only a few decorative items

____ 46. A home that comes to the construction site with the plumbing and wiring in place is a:

a. modular home
b. pannelized home
c. plan home
d. pre-cut home (kit).

Please check to see if you have responded to each item.

Thank you for the time you spent in responding to this test.

Comprehensive Consumer and Homemaking Test

Directions: Read each question carefully and decide on the best answer. Write the letter corresponding to your choice on the line to the left of the item.

_____ 1. Which of the following approaches would help Virginia, age 16, to gain ten pounds?

a. Follow a high protein, low carbohydrate diet.
b. Increase food intake at each meal and each snack.
c. Eat normally and decrease daily activity.

_____ 2. Using the recipe below, how much pancake mix would be needed if you were to make 12 pancakes?

To make	Ingredients		
	Mix	Water	Shortening
8 pancakes	1 cup	3/4 cup	--
16 pancakes	2 cups	1-1/2 cups	--
24 pancakes	3 cups	2-1/4 cups	--

a. 1-1/2 cups
b. 2-1/2 cups
c. 3-1/2 cups

_____ 3. Men as compared to women between the ages of 25 and 35 need most nutrients in

a. larger amounts.
b. the same amounts.
c. smaller amounts.

_____ 4. Important aesthetic considerations for meal planning are

a. aroma, food likes, time available.
b. color, texture, size and shape.
c. temperature, cost, season of year.

_____ 5. Which of the following has been added to enriched bread?

a. preservatives
b. B vitamins and iron
c. polyunsaturated fats

_____ 6. A homemaker interested in reducing the total food budget can select primarily

a. brand name food products.
b. regularly priced food products.
c. store name food products.

_____ 7. Which of the following would probably spoil first when stored in the refrigerator?

a. cured sausage
b. bologna
c. ground beef

_____ 8. Which of the following milk products has the greatest nutritional value per dollar spent?

a. fresh whole milk
b. powdered milk
c. evaporated milk

_____ 9. Human factors which influence decisions on the acquisition of textile products are

a. packaging, peers, family members.
b. packaging, peers, celebrities.
c. peers, celebrities, brand.
d. peers, celebrities, family members.

_____10. A consumer needs to take more precaution in the care of which of the following

a. silk, wool, acetate
b. cotton, rayon, silk
c. nylon, acetate, polyester
d. wool, nylon, silk

_____11. Clothing choices that reflect community values are viewed as showing

a. individuality.
b. selfishness.
c. inconsistency.
d. conformity.

_____12. Clothing needs can be identified by

a. shopping at a variety of stores.
b. recognizing the latest fads.
c. making a list of garments on hand.
d. seeing what others purchase.

_____13. Linen is a fabric made from which of the following fibers?

a. cotton
b. jute
c. hemp
d. flax

_____14. Filament fibers are the basis for fabrics made up of

a. silk.
b. rayon.
c. woolen.
d. cotton.

_____15. The availability of textile products is <u>least</u> influenced by

a. care.
b. demand.
c. technology.
d. raw material.

_____16. Mass production of textile products usually

a. changes fashions, increases the cost.
b. increases availability, decreases cost.
c. decreases cost, increases the quality.
d. increases the quality, increases the cost.

_____17. Which of the following statements is true?

a. Women have always worked to help maintain their families.
b. The women who helped settle the west were not expected to do the work ordinarily done by men.
c. Ever since our country was settled, women have been expected to find employment outside the home.
d. There is no relationship between historical events and the work role of women.

_____18. Which of the following is the best definition of a central decision?

a. A central decision is a means of ordering priorities of goals in order to reach consensus.
b. a central decision involves clear statements about objectives, resources and choices among alternatives.
c. A central decision is a decision which settles differences among people about what to do in a given situation at a given time.

_____19. Of the following statements, all <u>except one</u> is a statement of fact. Select the statement which is an expression of opinion with no basis in fact.

a. Employed women generally have many reasons for working.
b. The number of women employed outside the home today is greater then ever before.
c. Employed women are neglecting their families.
d. Working women help to keep many families out of poverty.

_____20. As a child increases in age

a. his need for friends his own age decreases.
b. his need for adult supervision increases.
c. his ability to take care of eating and dressing increases.
d. all of the above.

_____21. A current trend is for women to be employed outside the home. This is a social change. Which of the following is <u>not</u> a result of the change?

a. use of different food preparation and eating habits
b. enactment of the Fair Labor Standards Act
c. change in home responsibilities of family members
d. purchase of more ready-made goods

_____22. A person's role is determined mostly by his

a. position.
b. character.
c. parents.
d. education.

_____23. As gasoline prices go up, bicycles become more popular. As a result, there is a sudden increase in the number of bicycles being purchased without an accompanying increase in production of bicycles. The price of bicycles would

a. go down because more bicycles are being sold.
b. stay constant because the manufacturer's costs are constant.
c. stay constant because production eventually would keep up with demand.
d. go up because the demand increased and the inventory decreased.

_____24. In setting up a budget, the <u>most</u> important thing to consider is

a. the form you are going to use to set up the budget.
b. what the money has to pay for between pay periods.
c. the length of the pay period.
d. the average budget figures for a family of your size and income.

_____25. The primary responsibility of the consumer in using credit is

a. borrowing on time only what one can afford.
b. paying on debts what he/she can afford every month.
c. knowing how to figure the true interest rate.
d. limiting the use of credit to emergency needs.

_____26. The Carlson family values spending time together. Jane, their daughter, has four choices for Sunday night. To be consistent with her family's lifestyle, Jane probably will

a. go to the youth group meeting at church.
b. play a game with her younger sister.
c. work on school assignment at the library.
d. have family members participate in different activities.

_____27. Consumers can best improve products by

a. complaining about poor products to the seller and the producer.
b. refusing to purchase faulty products.
c. throwing away faulty products.
d. warning friends about poor products.

_____28. Employment of the homemaker has costs which can be measured in terms of

a. time, effort, money.
b. skills, resources, attitudes.
c. goals, resources, alternatives.
d. time, money, skills.

_____29. Name brand aspirin costs more than generic brand aspirin because it

a. is packaged better than the non-name brand.
b. works more effectively than the other brand.
c. has more advertising to make it seem different.
d. uses better labeling techniques than the other brand.

_____30. Preserving the environment in our country for us and for future generations involves

a. returning to a more primitive existence.
b. modifying lifestyles and goals.
c. increasing the productive capacity.
d. decreasing consumption by all segments of our economy.

_____31. Low birth weight, abnormal heart, joint defects and abnormal eye shapes are possible birth defects due to the mother's use of

a. cigarettes.
b. coffee.
c. cola beverages.
d. beer or liquor.

_____32. An infant's intellectual development can <u>best</u> be stimulated by

a. a small, affectionate pat.
b. use of mobiles and colorful toys.
c. a busy, noisy environment.
d. providing time in a play pen.

_____33. Which disease can cause birth defects in an infant if contracted by the mother during early pregnancy?

a. rubella
b. pneumonia
c. influenza
d. diabetes

_____34. Parents are legally responsible for economic support of a child until what age?

a. 16
b. 18
c. 19
d. 21

_____35. Which of the following treatments should be used for minor burns?

a. Hold the burned area under lukewarm running water.
b. Cover the burned area with butter.
c. Immediately place the burned area in cold water.
d. Break the small blisters which form.

_____36. In which situation will the Rh factor create a problem with pregnancies following the birth of the first child?

a. Mother and father are Rh positive.
b. Father is Rh negative and mother is Rh positive.
c. Mother is Rh negative and father is Rh positive.
d. Mother and father are Rh negative.

_____37. When a child is playing in a sandbox, filling and emptying containers, he/she is most likely developing the idea of

a. number.
b. texture.
c. space.
d. shapes.

_____38. What should one do first before deciding to become a parent?

a. Examine one's feelings and reason for wanting a child.
b. Talk with others who have raised children.
c. Read books and magazine articles on parenting.
d. Do all the "fun" things one wants to do.

_____39. Housing should provide all of the following <u>except</u>

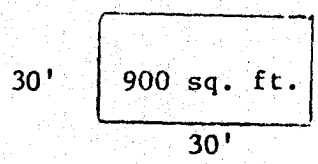
a. territory.
b. shelter.
c. security.
d. economy.

_____40. Which of the following initials appearing on an electric appliance says it meets specifications of a wiring authority?

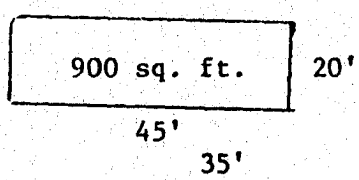
a. FTC
b. UL
c. FDA
d. BBB

_____41. The following house shapes enclose the same amount of floor space. The Clarks wish to have the most floor space at the lowest possible cost. Which house shape will provide this?

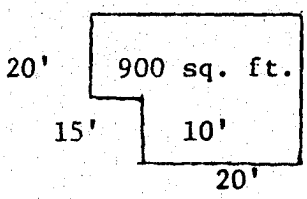
a.



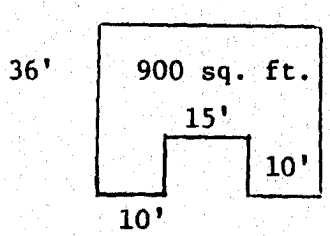
b.



c.



d.



_____42. Symptoms of inadequate wiring include all of the following except

a. lights flickering and dimming when appliances are turned on.
b. a fuse blowing or circuit breaker tripping when all lights and appliances are turned on at once.
c. TV picture shrinking in size or wincing when other appliances are plugged in.
d. long electric cords strung around rooms or octopus connections for clocks and lamps.

_____43. The type of housing which most closely resembles a single family dwelling when value appreciation and tax breaks are considered is a

a. condominium.
b. co-operative.
c. duplex.
d. mobile home.

_____44. All the following may aid kitchen efficiency except

a. the arrangement of range, sink, and refrigerator freezer.
b. the amount and arrangement of counter space.
c. the amount and arrangement of cabinet storage space.
d. pantry storage for pots and pans.

_____45. A copy of all public records concerning a property is a (an)

a. abstract of title.
b. agreement of sale.
c. mortgage.
d. title.

_____46. The "principal" with reference to home financing refers to

a. the sum of money actually borrowed.
b. the total money paid in purchase of the house.
c. the amount of the monthly payment of the house.
d. the amount of interest paid on a mortgage.

Please check to see if you have responded to each item.

Thank you for the time you spent in responding to this test.

May 1, 1980
Form E01

Comprehensive Consumer and Homemaking Test

Directions: Read each question carefully and decide on the best answer. Write the letter corresponding to your choice on the line to the left of the item.

_____ 1. Vegetables purchased from a farmers market as compared to a supermarket are usually

a. fresher.
b. less expensive.
c. prepackaged.

_____ 2. The best source of information on a new appliance is a

a. conversation with a friend.
b. recommendation by a sports celebrity.
c. consumer's report publication.

_____ 3. Safe working procedures in the kitchen

a. promote accidents.
b. reduce accidents.
c. have no effect on accidents.

_____ 4. Jack is not satisfied with a purchased food item. He should

a. call the local FDA office and complain.
b. telephone the store and complain.
c. return it to the store manager and complain.

_____ 5. Which of the following approaches would help Cindy, age 17, lose ten pounds?

a. Eat smaller servings at each meal and each snack.
b. Follow a high protein, low carbohydrate diet.
c. Reduce caloric intake to 800 calories daily.

_____ 6. Which of the following is the best processing method for home canning spaghetti sauce?

a. pressure cooker
b. boiling water bath
c. open kettle

_____ 7. The decision as to which person prepares a meal may be based on

a. eating habits.
b. food preparation abilities.
c. a friend's family.

_____ 8. What is one function of minerals in the body?

a. build strong bones
b. control breathing
c. regulate temperature

_____ 9. Safe use of sewing equipment will most ensure

a. damage to equipment.
b. performance of equipment.
c. short life of equipment.
d. warranty on equipment.

____ 10. The guide sheet identifies pattern pieces by

a. name, shape, number.
b. name, grain, number.
c. name, layout, shape.
d. name, grain, shape

____ 11. Safety while making a garment does not include

a. protection of one's body.
b care of sewing equipment.
c. a neat work area
d. knowing all steps needed to complete the garment.

____ 12. When planning a wardrobe one should look first at

a. present wardrobe.
b. new fashions.
c. own sewing skills.
d. available finances.

____ 13. Safety exists for consumers when recommendations are followed regarding

a. care and use.
b. care and design.
c. finishes and design.
d. finishes and use.

____ 14. Sue wants to purchase an evening dress for the spring dance. Which qualities will be most important in her selection?

a. appearance and cost
b. comfort and durability
c. care and cost
d. appearance and durability

____ 15. An individual's self-concept is most influenced by

a. climatic conditions.
b. cost of clothes.
c. season's fashions.
d. social situation.

____ 16. A teenage consumer may be dissatisfied with cotton jeans after laundering due to

a. wrinkling.
b. shrinkage.
c. raveling.
d. fading.

____ 17. An example of an advertising statement that can be relied upon when making a purchase is

a. "It can't be beat".
b. "Better than any other".
c. "Made of 100% virgin wool".
d. "Contains whitening agent X-80".

____ 18. Which of the following listings of four steps in making a satellite decision is in correct order?

a. Seek alternatives, make the choice, check resources, clarify the goal.
b. Check resources, seek alternatives, clarify the goal, make the choice.
c. Clarify the goal, check resources, seek alternatives, make the choice.
d. Make the choice, clarify the goal, check resources, seek alternatives.

____ 19. An example of a materialistic lifestyle is

a. passing up a job promotion so you can spend more time with your family.
b. quitting a job as a pro football player and taking a job in a sporting goods store to avoid injuries.
c. leaving a good job and moving to a wilderness area in order to be close to nature.
d. buying a new sports car instead of going to college.

____ 20. When purchasing a house, a family first considers

a. amount of repair the house needs.
b. preference of color scheme.
c. family income and assets.
d. insurance rate of the house.

____ 21. Government agencies that provide consumer protection through regulations are

a. manufacturers, retailers, and wholesalers.
b. Better Business Bureaus, Chambers of Commerce.
c. Food and Drug Administration, Federal Trade Commission.
d. local, state and national consumer organizations.

_____ 22. Exercising the proper judgment and restraint when transacting business is considered part of the consumer's

a. satisfaction.
b. responsibility.
c. shopping ability.
d. given rights.

____ 23. Jill is concerned that she have Vitamin C in her diet. Oranges are a good source of Vitamin C but she finds they are too expensive. She decides instead to buy canned orange juice. What are the two most important advantages to her of this choice over oranges?

a. lower cost, similar nutritive value
b. lower cost, easily prepared
c. similar nutritive value, more available
d. more available, more easily prepared

____ 24. Factors that determine credit rating include all the following except

a. capacity.
b. capital.
c. character.
d. convenience.

____ 25. How a person is expected to act in a situation is called his

a. position.
b. status.
c. role.
d. society.

____ 26. Which of the following statements about family decision making is true?

a. Since resources tend to be about the same from family to family, they do not need to be considered in decision making.
b. Once a family has made a decision, it should not be changed.
c. A family's goals and resources are important to consider when making a decision.
d. Money is always an important consideration in making a decision.

Larry and Carole had planned to live as cheaply as possible so they could save money to have a family. However, one day Larry came home and told Carole that he had ordered a color TV to be delivered that afternoon.

____ 27. Which of the following statements best describes what happened?

a. They had not clarified their goal.
b. They do not have enough money to pay for the color TV.
c. Carole tried to make Larry do what she wanted.
d. Larry had not accepted the goal.

____ 28. What will Carole and Larry do now?

a. Postpone having a family.
b. Bicker about money problems.
c. Find a way to earn more money.
d. All of the above.
e. Can't tell for sure.

____ 29. Which of the following best describes the way new positions are achieved?

a. When a person is born, his parents place certain limits on him which determine his position.
b. A person's sex sets definite limits on the position he can acquire.
c. When a person performs the activities assigned to a certain role, he begins to occupy the position which goes with the role.
d. Society requires and expects certain roles which each citizen learns by contact with others.

____ 30. The following statements describe the relationship between women's employment and their part in family decision making. Which one is true?

a. As women become employed, they tend to pay less attention to family decisions.
b. Employed women will be more likely to let their husbands make the decisions.
c. There is no relationship between women's employment and their part in making family decisions.
d. Women who are employed tend to have more say in family decision making.

____ 31. Which would be most likely to have planned activities to prepare children for kindergarten?

a. family day care centers
b. group day care centers
c. nursery schools
d. home care by a friend or relative

____ 32. Children who are disadvantaged would benefit most by

a. playing with their neighbors.
b. starting kindergarten a year later than usual.
c. visiting parks and playgrounds.
d. participating in a Head Start program.

____ 33. Which is not true of a good community day-care program?

a. Conducts after school program for elementary school children.
b. Restricts attendance to children 18 months of age or older.
c. Takes the place of children's homes for part of the day.
d. Offers children individual attention and affection.

____ 34. How should a woman modify the amount of food eaten from the Basic Four during pregnancy?

a. fewer servings from each group
b. fewer servings from grain group
c. more servings from each group
d. more servings from milk group

____ 35. The intellectual development of the baby before birth can be influenced by

a. basic nutritional condition of the mother.
b. the physical exercise of the mother.
c. the educational level of the parents.
d. the type of reading done by the mother during pregnancy.

____ 36. When does ovulation usually occur on a 28-day menstrual cycle?

a. during the first 3-5 days
b. during the first 8-10 days
c. on or about the 14th day
d. during the last 3 or 4 days

____ 37. A good way to help a child deal with feelings of jealousy is to

a. punish the child when he/she shows signs of jealousy.
b. explain why it is "silly" to be jealous.
c. show the child why jealousy is bad.
d. try to give the child more attention.

____ 38. An example of a large-muscle building toy for a 5 year old is

a. scissors.
b. measuring cups.
c. scooter.
d. color prisms.

____ 39. The Halls are looking for a house the condition of which will be easy to assess, is spacious and has a stable tax base. Which of the following would be best for them to investigate?

a. a mobile home
b. a new housing development with construction in progress
c. an older home in the city
d. a planned unit development

____ 40. The value of a lease is that it

a. insures a tenant of the same rent as long as he or she lives in the apartment
b. lowers rental cost
c. raises profits
d. outlines the rights and responsibilities of the landlord and the tenant.

____ 41. All the following will help to organize room clutter/or prevent a cluttered appearance except

a. pictures, posters, and collections on walls of rooms.
b. under-bed cardboard boxes for storage of children's toys.
c. old trunks or chests for storage and seats or tables.
d. pictures and collections grouped on walls or on shelves.

____ 42. If you wished to have a solar heating system installed, your first consideration after looking at your budget would be

a. environmental effects.
b. political implications.
c. public acceptance.
d. technological advancements.

____ 43. The preferred insulation R-value for ceilings of homes in Iowa is

a. 10
b. 13
c. 22
d. 30

____ 44. When looking at a used home, which of the following is a sign of a serious defect that should be avoided?

a. broken windows
b. cracks in the foundation
c. shabby yard
d. flaking paint

____ 45. The major uses of energy in the home are

a. clothes drying and washing.
b. entertainment and cleaning.
c. refrigeration and cooking.
d. space heating and water heating.

____ 46. Factors affecting sound control in a house include all the following except

a. the site or location of the house.
b. separation of activity and rest areas.
c. the kind of roof and foundation material.
d. insulation and insulating materials in or on walls, ceiling, floors.

Please check to see if you have responded to each item.

Thank you for the time you spent in responding to this test.

APPENDIX D: COMPREHENSIVE CONSUMER AND HOMEMAKING TEST ANSWER SHEETS

Comprehensive Consumer and Homemaking Test
Form A
Answer Sheet

1.	b	24.	c
2.	a	25.	b
3.	b	26.	c
4.	c	27.	b
5.	a	28.	c
6.	a	29.	b
7.	b	30.	a
8.	b	31.	c
9.	b	32.	c
10.	c	33.	c
11.	a	34.	d
12.	b	35.	b
13.	a	36.	a
14.	b	37.	c
15.	c	38.	d
16.	d	39.	d
17.	d	40.	c
18.	c	41.	b
19.	a	42.	d
20.	b	43.	a
21.	b	44.	c
22.	d	45.	c
23.	d	46.	d

Comprehensive Consumer and Homemaking Test
Form B
Answer Sheet

1.	a	24.	a
2.	a	25.	d
3.	c	26.	c
4.	a	27.	c
5.	b	28.	b
6.	c	29.	b
7.	b	30.	c
8.	c	31.	d
9.	d	32.	c
10.	d	33.	b
11.	d	34.	b
12.	a	35.	a
13.	c	36.	c
14.	b	37.	a
15.	b	38.	b
16.	c	39.	a
17.	d	40.	c
18.	d	41.	c
19.	d	42.	d
20.	c	43.	b
21.	c	44.	c
22.	d	45.	d
23.	d	46.	c

Comprehensive Consumer and Homemaking Test
Form C
Answer Sheet

1. a
2. c
3. c
4. b
5. c
6. b
7. a
8. a
9. c
10. a
11. c
12. d
13. b
14. c
15. d
16. d
17. a
18. b
19. b
20. c
21. d
22. a
23. b
24. a
25. d
26. d
27. d
28. e
29. a
30. b
31. d
32. c
33. b
34. b
35. a
36. b
37. a
38. a
39. a
40. b
41. c
42. c
43. b
44. a
45. a
46. a

Comprehensive Consumer and Homemaking Test
Form D
Answer Sheet

1.	b	24.	b
2.	a	25.	a
3.	a	26.	b
4.	b	27.	a
5.	b	28.	a
6.	c	29.	c
7.	c	30.	b
8.	b	31.	d
9.	d	32.	b
10.	a	33.	a
11.	d	34.	b
12.	c	35.	c
13.	c	36.	c
14.	a	37.	c
15.	a	38.	a
16.	b	39.	d
17.	a	40.	b
18.	c	41.	a
19.	c	42.	c
20.	c	43.	a
21.	b	44.	d
22.	a	45.	a
23.	d	46.	a

Comprehensive Consumer and Homemaking Test
Form E
Answer Sheet

1. a
2. c
3. b
4. c
5. a
6. a
7. b
8. a
9. b
10. a
11. d
12. a
13. a
14. a
15. d
16. b
17. c
18. c
19. d
20. c
21. c
22. b
23. a
24. d
25. c
26. c
27. d
28. e
29. c
30. d
31. c
32. d
33. b
34. d
35. a
36. c
37. d
38. c
39. c
40. d
41. a
42. d
43. d
44. b
45. d
46. c